PHYSICS ABSTRACTS

BEING

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ABSTRACTS 1–322

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MATHEMATICS

1 511.221

General congruences involving the Bernoulli numbers. VANDIVER, H. S. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 324–328, *Aug.*, 1942.

2 512.31

On a theorem of J. L. Walsh concerning the moduli of zeros of polynomials. VIJAYARAGHAVAN, T. *Proc. Indian Acad. Sci. A*, 16, *pp.* 83–86, *July*, 1942.

3 512.896 : 513.723.6

On the number of terms in a simple algebraic form. LITTLEWOOD, D. E. *Proc. Camb. Phil. Soc.*, 38, *pp.* 394–396, *Oct.*, 1942.—Hodge's formula [Abstr. 965 (1942)] for the number of independent terms in a k-connex is demonstrated in the general case.

4 513.15

An inequality for two triangles. PEDOE, D. *Proc. Camb. Phil. Soc.*, 38, *pp.* 397–398, *Oct.*, 1942.

5 513.65

The postulation of a multiple curve. SEGRE, B. *Proc. Camb. Phil. Soc.*, 38, *pp.* 368–377, *Oct.*, 1942.

See Abstr. 3 513.723.6 : 512.896

6 513.735.96

Note on a limit related to the curvatures of two surfaces. FRIEDLANDER, F. G. *Proc. Camb. Phil. Soc.*, 38, *pp.* 399–400, *Oct.*, 1942.

7 513.763.3

Transformation theory of isogonal trajectories of isothermal families. KASNER, E., AND CICCO, J. DE. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 328–333, *Aug.*, 1942.

8 517.512.2 : 518.5 : 681.14

A machine for the rapid summation of Fourier series. MACEWAN, D., AND BEEVERS, C. A. *J. Sci. Instrum.*, 19, *pp.* 150–156, *Oct.*, 1942.—A machine is described which is capable of performing automatically the process of Fourier synthesis, Fourier terms being added at the rate of about 1 every 2 sec. E. R. A.

9 517.521.8

On Hausdorff's methods of summability. II. ROGOSINSKI, W. W. *Proc. Camb. Phil. Soc.*, 38, *pp.* 344–363, *Oct.*, 1942.—[See Abstr. 968 (1942)].

10 517.522.2

Symmetric relations between the coefficients of reversed power series. BLEICK, W. E. *Phil. Mag.*, 33, *pp.* 637–638, *Aug.*, 1942.

See Abstr. 13 517.564.4 : 517.942.43

11 517.63

Some new values for the exponential integral. COULSON, C. A., AND DUNCANSON, W. E. *Phil. Mag.*, 33, *pp.* 754–761, *Oct.*, 1942.

12 517.93

Differential equations of the type $y''' = Gy'' + Hy'^2$. KASNER, E. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 333–338, *Aug.*, 1942.—The article discusses the various problems in geometry and physics which give rise to the general third-order differential equations.

13 517.942.43 : 517.564.4

On certain expansions of the solutions of the general Lamé equation. ERDÉLYI, A. *Proc. Camb. Phil. Soc.*, 38, *pp.* 364–367, *Oct.*, 1942.

14 517.947.44

On the solutions of the wave equation with discontinuous derivatives. FRIEDLANDER, F. G. *Proc. Camb. Phil. Soc.*, 38, *pp.* 378–382, *Oct.*, 1942.

See Abstr. 157 518.3 : 536.423.15

See Abstr. 268 518.3 : 541.115

15 518.4

The Saqqara graph: its geometrical and architectural significance. WILLIAMSON, R. S. *Nature, Lond.*, 150, *pp.* 460–461, *Oct.* 17, 1942.

See Abstr. 8 518.5 : 681.14 : 517.512.2

16 519.272.13

A test of significance for multiple observations. KOSAMBI, D. D. *Curr. Sci.*, 11, *pp.* 271–274, *July*, 1942.—The z-test is extended partially to samples drawn from a normally distributed population in $p > 2$ linearly independent variates.

17 519.53

Some generalizations of the ergodic theorem. PITT, H. R. *Proc. Camb. Phil. Soc.*, 38, *pp.* 325–343, *Oct.*, 1942.—Extends the classical ergodic theorems to n-parameter groups.

ASTRONOMY. GEODESY

18 521.042

Chlorine in stellar atmospheres. THACKERAY, A. D. *Observatory*, 64, *pp.* 338–339, *Oct.*, 1942.

19 521.921

Note on the calculation of precession. SADLER, D. H. *Mon. Not. Roy. Astr. Soc.*, 102, 4, *pp.* 215–216, 1942.—Formulae, based on Legendre's theorem, are given for the reduction for precession of star positions from one equinox to another; the accuracy increases as the pole is approached.

20 522.982.7

Irregularities of transmission microphotometer records due to photographic granularity. BARBER, D. R. *Observatory*, 64, *pp.* 329–331, *Oct.*, 1942.—In tracings obtained from the usual microphotometer, recording on a transmission scale, there occurs a max. amplitude of fluctuation at a photographic density of approx. 0·2 by reason of the granularity of the photographic negative material.

21 523.31

On the lunar equation. JEFFREYS, H. *Mon. Not. Roy. Astr. Soc.*, 102, 4, *pp.* 194–204, 1942.—The data used by Spencer Jones [Abstr. 684 (1942)] for determining the mass of the Moon are rediscussed to obtain an estimate of uncertainty based on a larger number of degrees of freedom. Fortnightly intervals are used, instead of monthly, after subtracting from the Eros residuals an estimate of the fluctuations not due to the Moon. The fortnightly residuals are not distributed according to the normal error

law, and the solution is made with weights depending on the ratio of each residual to its apparent standard error. Thence the coeff. of the lunar inequality becomes $6''.4378 \pm 0''.0018$ (s.e.). The assumption of hydrostatic equilibrium in the Earth's interior is rejected, and the data recombined without it. The new value of the constant of nutation is confirmed. A. HU.

22 523.51

The Pakenham meteorite. EDWARDS, A. B., AND BAKER, G. *Proc. Roy. Soc. Vict.*, 54, 1, *pp.* 7–19, 1942.—A description of structure and composition.

23 523.61

Comet notes. *Observatory*, 64, *p.* 339, *Oct.*, 1942.—Discovery of a comet by Oterma on 1942 September $11^d\ 23^h$. Its position was R.A. $23^h\ 51^m$., Dec. 6° 20′ N. The motion was 25 sec. W. and 2 min. S. Magnitude 13.

24 523.74 = 3

Structure of the solar atmosphere. WALDMEIER, M. *Helv. Phys. Acta*, 15, 4, *pp.* 405–422, 1942.—The Sun is assumed to consist almost entirely of hydrogen (H : metals = 7 000 : 1), H^- ions contributing largely to the continuous absorption coeff. The electron pressure is then much smaller and the gas pressure more than 10 times larger than in the Unsöld theory. The layer responsible for most of the emitted radiation is only 500 km. thick: this accounts for the sharpness of the limb. Comparison of the structure of sunspots with that of the undisturbed disc shows that the centre of radiation lies at the same level for both; but that at high levels the pressure in the photosphere is $>$ that in spots, whereas at low levels the reverse holds. The resulting horizontal currents are observed to flow with velocities in quantitative agreement with those calculated from the theory. A. HU.

See Abstr. 322 523.75 : 551.594.11

25 523.802

Obscured regions in the Greenwich astrographic zone. MARTIN, E. G. *Mon. Not. Roy. Astr. Soc.*, 102, 5, *pp.* 238–241, 1942.—The paper examines separate counts for the Greenwich region (Dec. + 64° to 87°, galactic latitude + 4° to + 51°). A comparison of the average log N_m at different lat. and long. with more recent figures by van Rhijn is made. A residual for each region is derived, and 29 regions are adjudged to have negative values too large to be accidental but to be due to real absorption.

26 523.813

Stellar parallaxes determined photographically at the Royal Observatory, Cape of Good Hope (thirteenth list). *Mon. Not. Roy. Astr. Soc.*, 102, 5, *pp.* 248–253, 1942.

27 523.821

Magnitudes and colours of O- and early B-type stars south of −35° declination. WILLIAMS, E. G., AND KNOX-SHAW, H. *Mon. Not. Roy. Astr. Soc.*, 102, 5, *pp.* 226–236, 1942.—The paper contains the magnitudes in 3 colours of the O and early B stars S. of − 35° and brighter than 6·0 mag., together with those of a few stars further N., from which have been deduced *Pg* and *Pv* magnitudes and colour indices. The *Pv* magnitudes are compared with Harvard values.

28 523.821.3

The magnitude/diameter law in the photographic photometry of bright stars. EDWARDS, D. L. *Mon. Not. Roy. Astr. Soc.*, 102, 5, *pp.* 242–245, 1942.—A redetermination has been made of the relation between photographic image diameters and magnitudes of stars obtained with different lenses and emulsions. Earlier formulae fail when applied to bright stars, and take no account of the effect of star colours. A new formula is suggested, of extended applicability and including a parameter dependent on colour. The implications of this formula on Bouguer's law of light distribution in the photographic emulsion are described.

29 523.821.3

Magnitudes and colour indices of γ Cassiopeiae. EDWARDS, D. L. *Mon. Not. Roy. Astr. Soc.*, 102, 5, *pp.* 246–247, 1942.—Magnitude observations (photographic and photovisual) have been made of γ Cas by diameters of images, using a new magnitude/diameter law. Results are tabulated for the period 1940, June, to 1942, March 24, the variations discussed and correlations with spectrum changes indicated.

30 523.823 : 535.23

On the internal constitution of the stars. HOYLE, F., AND LYTTLETON, R. A. *Mon. Not. Roy. Astr. Soc.*, 102, 4, *pp.* 177–193, 1942.—General expressions are derived for the luminosity and radius of a main-sequence star, given its mass and composition and assuming that the C–N cycle is the source of its energy. Two cases arise, in which the opacity is due to photo-electric absorption and to electron scattering respectively. The whole star cannot be in radiative equilibrium: the central core containing $\frac{1}{8}$ of the mass but occupying only 0·005 of the vol. is in convective equilibrium and is the source of most of the energy. The theoretical mass/luminosity curves obtained agree with observation. A. HU.

31 523.823.4 : 535.23

On the nature of red giant stars. HOYLE, F., AND LYTTLETON, R. A. *Mon. Not. Roy. Astr. Soc.*, 102, 5, *pp.* 218–225, 1942.—The solution of the equations governing the radiative equilibrium of the outer part of a star is considered with a view to obtaining the accurate solution in the case of negligible radiation pressure and finding the error introduced by putting $\rho \propto T^{3\cdot25}$ in the exterior. By this approximation the radius of a star, when the atmosphere has mol. wt. less than in the interior, can be calculated; a considerable increase of radius may result. A difference of composition of more than a certain amount leads to there being no equilibrium configuration available for the atmosphere. The causes leading to the conditions for giant stars and non-static atmospheres are discussed.

32 523.841.11

Nova Cygni (1942). ALTER, G. *Nature, Lond.*, 150, *pp.* 463–464, *Oct.* 17, 1942.

33 523.841.3

Pulsations of variable stars. BANERJI, A. C. *Curr. Sci.*, 11, *pp.* 269–270, *July*, 1942.

34 523.854.1

On the structure of galactic clusters. ALTER, G. *Mon. Not. Roy. Astr. Soc.*, 102, 4, *pp.* 205–210, 1942; *Disc., Observatory*, 64, *pp.* 309–317, *Oct.*, 1942.—The structure of galactic clusters is shown to be a function both of the gravitational influence of the galaxy and of the age in the spectral evolution. Based on Trumpler's classification, the clusters are divided into 4 classes representing in succession this development. Tables are given showing the relations between these classes and various structural properties of galactic clusters.

35 523.854.1

The system of galactic clusters in relation to the galaxy. ALTER, G. *Mon. Not. Roy. Astr. Soc.*, 102, *pp.* 211–214, 1942; *Disc., Observatory*, 64, *pp.* 309–317, *Oct.*, 1942.—A relation between observed distances of galactic clusters and galactic long. is explained by rejecting the assumption of uniform absorption. It is shown that most of the absorption is due to irregular clouds and that these clouds accumulate towards the galactic centre at about 350° longitude. In this direction the absorption coeff. suffers an increase of 5% per kpc. A relation between cluster numbers and galactic longitude shows that the position of the Sun is eccentric to a local system, part of which seems to be the cluster system. Its centre is at about 250° long.

36 523.859

On the Perseus cluster of nebulae. ZWICKY, F. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 317–320, *Aug.*, 1942.—The spatial distribution of the nebulae in this cluster is analysed from photographs taken with the Palomar 18 in. Schmidt camera. A total of 402 nebulae is found within a radius of 200′ from the centre, uniformly distributed except in the quadrant nearest the galactic equator. Assuming a local absorption of 0·55 mag., it is deduced that the diameter of the cluster is at least $1{\cdot}5 \times 10^6$ parsec, and that it contains over 1 000 nebulae. A. HU.

37 523.991.2

A grazing occultation at the Cape Observatory. *Observatory*, 64, *pp.* 337–338, *Oct.*, 1942.

38 526.918

Stereoscopic projection and map reading. FISHER, O. J. *Amer. J. Sci.*, 240, *pp.* 642–648, *Sept.*, 1942.—Describes modes of utilization of stereo-slides in map instruction both in groups and individually. A postscript gives detailed directions for constructing a simple hand viewer.

See Abstr. 98 526.918.5 : 535.317

PHYSICS: GENERAL

39 53 = 3 = 4

Report of the meeting of the Swiss Physical Society, Fribourg, May 9, 1942. *Helv. Phys. Acta*, 15, 4, *pp.* 311–342, 1942.—Distribution of the structures of crystalline compounds over the 219 space groups, Nowacki, W.; Nuclear photo-effect with lithium γ-rays, Huber, O., Lienhard, O., Scherrer, P., and Wäffler, H. [Abstr. 227 (1943)]; Activity induced in chlorine with rapid neutrons, Huber, O., Lienhard, O., and Wäffler, H.; Three demonstrations of the dynamic lens, Dessauer, F., Meier, F., Metzger, S., and Saxer, L.; Photo-dissociation of diatomic molecules into ions, Wehrli, M., and Hälg, W.; Infra-red spectra of higher dicarboxylic acids, Wehrli, M., and Schönmann, E.; Terms of higher multiplicity in molecular spectra, Miescher, E., and Müller, W.; Determination of acoustic resonances by the hot-wire method, Loebenstein, A.; New hydrodynamic principle for measurement of sound, Zickendraht, H. [Abstr. 93 (1943)]; Phenomenon of fission and the atoms which result, Jacquerod, A.; Spontaneous Kerr effect with KH_2PO_4 and KH_2AsO_4 crystals, Bantle, W., Busch, G., Lauterburg, B., Scherrer, P. [Abstr. 181 (1943)]; Elastic behaviour of piezo-electric substances, Bantle, W., and Lüdy, W.; Relation between spin and statistics, Stückelberg, E. C. G.; Effect of ultrasonic waves on the diffraction of X-rays by crystals, Weigle, J.; Meson theory of nuclear forces, Fierz, M. [Abstr. 218 (1943)]; Stabilization of the magnetic field of the cyclotron, Baumgartner, H., Extermann, C. R., Gugelot, P. C., Preiswerk, P., and Scherrer, P. [Abstr. 81 B (1943)]; Oil diffusion pumps, Baumgartner, H., Extermann, C. R., Gugelot, P. C., Prieswerk, P., and Scherrer, P. [Abstr. 154 B (1943)]; Ion source for the cyclotron, Baumgartner, H., Extermann, C. R., Gugelot, P. C., Preiswerk, P., and Scherrer, P. [Abstr. 155 B (1943)]; Colour-blind spot in an otherwise normally colour-sensitive retina, Besso, M. [Abstr. 150 (1943)]; Use of the Wheatstone bridge for the continuous registration of variations of electrical resistance, Brasey, E. [Abstr. 107 B (1943)]; New method for determination of dimensions of ions by the loss of ions from a unipolar ionized current of gas, Joyet, G.; Charging process in the cascade generator, Jaggi, M.; Logical-physical parallelism, Besso, M.

40 53.081

Dimensions and the facts of measurement. CAMPBELL, N. *Phil. Mag.*, 33, *pp.* 761–771, *Oct.*, 1942.—A general discussion in which the author gives particular consideration to the definitions of common terms. E. R. A.

41 53.081.5

Units and dimensions. GUGGENHEIM, E. A. *Phil. Mag.*, 33, *pp.* 479–496, *July*, 1942.—Stresses the need for clarity in fundamental concepts, correlates e.s.u. and m.k.s. units, adopting the "franklin" as that unit charge which repels a similar charge with a force of 1 dyne at a distance of 1 cm., and deals briefly with the rationalization of electromagnetic quantities. Postulates as fundamentals for dimensional analysis, length, time, energy, charge and temperature; regards further reduction in number of distinct entities as unhelpful. G. F. F.

42 53.081.5

Dimensions. WILSON, W. *Phil. Mag.*, 33, *pp.* 631–637, *Aug.*, 1942.—[See Abstr. 2021 (1942)]. Correspondence.

43 53.081.5

On the dimensions of physical magnitudes. (Second Paper.) DINGLE, H. *Phil. Mag.*, 33, *pp.* 692–699, *Sept.*, 1942.—[See Abstr. 42 (1943)]. Correspondence.

44 53.081.5

Note on some recent papers on physical quantities and their dimensions. DUNCANSON, W. E. *Proc. Phys. Soc., Lond.*, 54, *pp.* 504–509, *Nov.*, 1942.—[Abstr. 1434 (1941), 1487 (1942)].

45 53.081.6

The theoretical values of the physical constants. EDDINGTON, A. *Proc. Phys. Soc., Lond.*, 54, *pp.* 491–504, *Nov.*, 1942.—The principal physical constants are calculated by the theory developed [Abstr. 4241 (1937) and 540 (1940)]. There is satisfactory agreement with Birge's values [Abstr. 2023 (1942)]. But the theory also indicates that small corrections are required in the computation of certain const. from exp. data; when these corrections are included, the small discordance betw. the spectroscopic and deflection values of $e/m_e c$ disappears, and the agreement of observation and theory is complete. There ought to be no difference betw. the direct and indirect values of h/e. The calculated const. of gravitation is $6{\cdot}6665 \cdot 10^{-8}$; the expected agreement of the calculated and observed values is not affected by the mean chemical constitution of the universe or the free radiant energy in space—a point previously left doubtful.

46 53.084.827

A method for grinding the internal wall of small-bore capillaries. TURK, E. P. DE, AND LOCKENVITZ, A. E. *Rev. Sci. Instrum.*, 13, *pp.* 295–296, *July*, 1942.

47 530.12 : 538.3

Relativistic aspect of the stress tensor of the electromagnetic field. CATTERMOLE, J. *Phil. Mag.*, 33, *pp.* 674–678, *Sept.*, 1942.—The author now investigates the case when the gravitational field is negligible and assumes that the contracted curvature tensor of the 5-dimensional field [see Abstr. 1476 (1942)] corresponds to the electromagnetic energy tensor. The tensor found is not symmetrical and certain of its components have to be ignored. Other components give the electromagnetic energy and a modified form of the Poynting vector.

G. C. McV.

48 530.14 : 539.153

On the virtual state of the deuteron. HULTHÉN, L. *Ark. Mat. Astr. Phys.*, 29*B*, 1, [11 *pp.*], 1942.—[See Abstr. 1477 (1942)]. The virtual energy levels of the deuteron are mathematically defined. In a continuous spectrum, such as that of the H atom, no virtual energy levels can be expected. The results are compared with those of other workers. A. J. M.

49 530.19

Note on the transparency of a potential barrier. JEFFREYS, B. *Proc. Camb. Phil. Soc.*, 38, *pp.* 401–405, *Oct.*, 1942.

50 531.19 : 536.42

On the statistical mechanics of change of state. SNYDER, H. *Phys. Rev.*, 62, *pp.* 63–67, *July* 1 *and* 15, 1942.—The nature of the pressure/density curve at const. temperature is investigated by the methods of the grand canonical ensemble for a system of identical molecules between which only short-range forces act. Except for surface effects, the total energy, entropy, etc., are $\propto$ the number of molecules in the system. The pressure is a non-decreasing function of the density which may have regions of constancy as a function of the density.

51 531.224

On the equilibrium of plates. STEVENSON, A. C. *Phil. Mag.*, 33, *pp.* 639–661, *Sept.*, 1942.—The author re-directs attention to the definition and nomenclature of stress resultants and stress couples in a plate; shows the usefulness of complex combinations of these stress resultants and couples in their transformation to other systems of co-ordinates, especially 2-dimensional orthogonal curvilinears, and gives the solution of the semi-inverse problem of plate theory in terms of complex potentials. The method is illustrated by examples relative to various boundaries, some of the results being new.

52 531.224

Distribution of stress in built-in beams of narrow rectangular cross section. HILDEBRAND, F. B., AND REISSNER, E. *J. Appl. Mech.*, 9, *A* 108–*A* 116, *Sept.*, 1942.—An approx. solution is derived by applying the principle of least work. A third-degree polynomial is assumed, and the spanwise variation of the stress curve is determined by means of the calculus of variations.

53 531.224.4

Numerical procedure for computing deflections, moments, and buckling loads. NEWMARK, N. M. *Repr. Univ. Ill. Engng Exp. Sta., No.* 23, *pp.* 691–718, *July* 7, 1942.—The method is of particular applicability in determining critical buckling loads and configurations of bars of variable cross-section. The numerical procedure is approximate, but leads to exact moments or deflections when the loading diagram is made up of segments that are bounded by straight lines or by arcs of parabolae.

54 531.224.4

Torsional and flexural buckling of bars of thin-walled open section under compressive and bending loads. GOODIER, J. N. *J. Appl. Mech.*, 9, *A* 103–*A* 107, *Sept.*, 1942.—The observed behaviour of torsionally weak columns in buckling by twisting or bending is analysed in this paper on the basis of Wagner's hypothesis. The theory is simplified, and extended to the general section and to bars, restrained by flexible sheets, and bars with constrained axes of rotation.

55 531.224.4

Buckling of semimonocoque structures under compression. WANG, T. K. *J. Appl. Mech.*, 9, *A* 117–*A* 121, *Sept.*, 1942.—It is assumed that the cylindrical structure is a very thin tube of circular cross-section; its reinforcements consist of uniform longitudinal stiffeners and transverse rings.

See Abstr. 238, 239 531.724 : 539.215.4

56 531.733 : 591.12

Volumetric microrespirometer for aquatic organisms. SCHOLANDER, P. F., AND EDWARDS, G. A. *Rev. Sci. Instrum.*, 13, *pp.* 292–295, *July*, 1942.

57 531.756 : 621.317.39

An electromagnetic densitometer. RICHARDS, A. R. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 595–596, *July* 15, 1942.—An apparatus is described in which the principle of balancing the attraction of a

agnetic field against the upthrust on a submerged mature is used as a rapid method of measuring quid densities. The precision of the determinations pends on the range of the instrument and is of the der of 1 : 800 for densities between 0·62 and 82 g./ml.

58 531.787.9 : 537.228.1

Piezometer for transient pressures. LAWSON, A. W., ND MILLER, P. H., JR. *Rev. Sci. Instrum.*, 13, 297–298, *July*, 1942.

59 531.788

Pressure-measuring device for moderate vacua. LINE, E. R. *Industr. Engng Chem.* (*Analyt. Edit.*), , *p.* 542, *July* 15, 1942.

60 531.791 = 4

Rapid mechanical counter. KIPFER, P. *Helv. Phys. cta*, 15, 4, *pp.* 423–432, 1942.—The counter described akes use of an escapement similar to that of a atch, the ratchet wheel advancing 1 tooth each time e ratchet makes a complete to and fro movement. he return is aided by spring loading. The 5 dials ead up to 10^5, but over 10^6 can be counted before e mainspring needs rewinding. Tests carried out y a stroboscopic method showed the counter to perate satisfactorily at pulse frequencies up to 570 per ec., with an accuracy within 2‰. A. W.

61 532.12

The compressibility of liquid *n*-octane. FELSING, V. A., AND WATSON, G. M. *J. Amer. Chem. Soc.*, 4, *pp.* 1822–1823, *Aug.*, 1942.—The compressibility as determined from 100° to 275° at pressures ranging rom the v.p. to approx. 300 atm.

62 532.13

The viscosity of *cis* and *trans* decahydronaphthalene. EYER, W. F., AND LESLIE, J. D. *J. Amer. Chem. Soc.*, 4, *pp.* 1912–1916, *Aug.*, 1942.—The viscosities were easured from − 30° to 180°. When $\log\eta$ is lotted against $1/T$ straight lines are not obtained, nd there is evidence that the *cis*-form undergoes some hange at 110°.

63 532.13

Viscosity of propane, butane and isobutane. LIPKIN, M. R., DAVISON, J. A., AND KURTZ, S. S., JR. *Industr. ngng Chem.*, 34, *pp.* 976–978, *Aug.*, 1942.

64 532.13 = 3

Measurements of the viscosity of crystalline liquids by the Helmholtz method. BECHERER, G., AND KAST, W. *Ann. Phys., Lpz.*, 41, 5, *pp.* 355–374, 1942.—Measurements [Abstr. 1075 (1936)] are made on *p*-azoxyanisole in both the crystalline liquid and the normal liquid phase. The construction of the apparatus, the measurements and their evaluation, are described in detail, and are preceded by an explanation of the principle of the method. The plot of the results gives 2 parallel straight lines. The lower represents the crystalline liquid and the upper the normal liquid phase. The transition between the 2 phases takes place abruptly at the temperature at which the turbidity clears. At 120°C. the viscosities are $\eta_{\parallel} = 0{\cdot}0242$, $\eta_{+} = 0{\cdot}0310$, $\eta_{o} = 0{\cdot}0362$, $\eta_{\perp} = \approx 0{\cdot}08$ according to the molecular orientation to the velocity gradient. H. G. S.

See Abstr. 86 532.13 : 533.7 : 533.16

See Abstr. 89 532.13 : 534.22

See Abstr. 245 532.13 : 541.68 : 539.217

See Abstr. 317 532.13 : 541.8

65 532.133

Viscosity/temperature function of liquids. IRANY, E. P. *Phil. Mag.*, 33, *pp.* 685–688, *Sept.*, 1942.—It is pointed out that the method recently employed by Nissan to show the existence of a general relation between liquid viscosity and temperature has already been used by Irany [see Abstr. 382 (1942)]. A. J. M.

See Abstr. 178 532.133 : 539.41 : 537.226.2 = 3

66 532.133 : 541.182 : 677.46 = 3

On the influence of the morphological and the molecular structure of cellulose on the viscose process. JUNG, K. P. *Kolloid Z.*, 98, *pp.* 192–199, *Feb.*, 1942.—Comparative measurements of the rel. viscosity of native cellulose with and without fibre structure showed V-shaped curves for the function of (time of solution)/(conc. of NaOH) for materials of diff. average deg. of dispersion. For native cellulose with fibre structure the optimum value of conc. lies betw. 12 and 14% NaOH. For cellulose, the fibre structure of which has been destroyed by wet grinding, these optimum values are shifted towards smaller conc., the more so for smaller values of average deg. of dispersion. This proves the decisive influence of the size of the molecule for native as well as for hydrated cellulose. The grinding was carried out cautiously so that the molecules and the lattice structure of the cellulose were kept intact. R. N.

See Abstr. 179 532.133 : 541.67 : 537.226.2

67 532.137

High-speed rotational viscometer of wide range. GREEN, H. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 576–585, *July* 15, 1942.—The viscometer is especially suitable for oils, varnishes, paints and printing inks; it is described in detail. Typical curves are shown and the theory and operational data discussed. E. H. W. B.

68 532.137

A simple viscometer for research and control. CROXTON, F. C. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 593–595, *July* 15, 1942.

69 532.137

Pipette-type capillary viscometer. WEILER, J. F. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *p.* 634, *Aug.* 15, 1942.

70 532.137

Viscosity determination of polymer solutions. YOUNG, D. W., AND MCARDLE, E. H. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 639–640, *Aug.* 15, 1942.—A new set of bubble tubes extends the Gardner–Holdt series to viscosities of 1 000 poises, and thus adapts this rapid method to the measurement of viscosities of high polymers in volatile solvents. The 11 tubes in the set are numbered from ½ to 10, and cover the range from 50 to 1 000 poises in steps of 100. To minimize effect of temperature, each tube is filled with a mixture of a 105 viscosity-index lubricating oil and a polybutene of 12 000 mol. wt.

71 532.137 = 3

On the rotation of two cylinders in a viscous fluid and the theory of the forces on the rotation viscometer with eccentric cylinders. MÜLLER, W. *Ann. Phys.*,

Lpz., 41, 5, *pp.* 335–354, 1942.—A mathematical treatment of the theory of the rotation viscometer for the general case of the rotation of the cylinders for any ratio of the radii and any degree of eccentricity, neglecting edge effects, in continuation of a previous paper [*Ingen. Arch.*, 13, *pp.* 37–58, 1942]. The analysis is carried out with the aid of curvilinear bipolar co-ordinates, and rigid solutions are established for the torques and forces which occur in the rotation of each of the 2 cylinders. H. G. S.

72 532.522

A variable capillary-tube leak. BAYLEY, D. S. *Rev. Sci. Instrum.*, 13, *pp.* 299–300, *July*, 1942.

73 532.522

Laboratory pressure flowmeter. BRADY, L. J., AND CORSON, B. B. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 656–657, *Aug.* 15, 1942.

74 532.543 = 3

Economical velocity in canals with free water surface. LANGHARD, K. *Schweiz. Bauztg*, 119, *pp.* 253–256, *May* 30, 1942.—A method is given to determine the most economical section of a canal, i.e. one that will minimize the annual cost, defined as consisting of loan charges plus the annual loss of energy. W. A. R.

75 532.582.4

The damping of the heaving and pitching motion of a ship. HAVELOCK, T. H. *Phil. Mag.*, 33, *pp.* 666–673, *Sept.*, 1942.—Using expressions for the wave motion due to alternating sources in a liquid, application is made to the heaving and pitching motions of a ship, and, in particular, to estimating the damping from the rate of propagation of energy outwards in the wave motion. This method assumes the damping to be small. It is concluded that the wave motion gives rise to large damping for both heaving and pitching, and that the decrements are probably comparable with those obtained experimentally. [See Abstr. 1398 (1940).

76 532.59 : 538.56

Existence of electromagnetic-hydrodynamic waves. ALFVÉN, H. *Nature, Lond.*, 150, *pp.* 405–406, *Oct.* 3, 1942.

77 532.612

An expression for the rate of return of an egg after artificial deformation. LANDAHL, H. D. *Bull. Math. Biophys.*, 4, *pp.* 139–147, *Sept.*, 1942.—The forces involved in the restoration of a deformed cell to its normal shape are considered. The most important forces are those due to surface tension, membrane elasticity and viscosity. An approx. expression is derived for the rate of return of an elongated or compressed egg.

78 532.685

The influence of packing on the movement of moisture through the soil. SREENIVASAN, P. S. *Curr. Sci.*, 11, *pp.* 287–288, *July*, 1942.

79 532.685

The effect of concentration on the capillary movement of some salt solutions through the black cotton soil. RAMDAS, L. A., MALLIK, A. K., AND PANDIT, U. P. *Curr. Sci.*, 11, *pp.* 288–289, *July*, 1942.

80 532.685

Studies on soils. I. The upward movement of water and salt solutions in the black cotton soil. II. A microscopic study of the behaviour of the black cotton soil in salt solutions. RAMDAS, L. A., AND MALLIK, A. K. *Proc. Indian Acad. Sci. A*, 16, *pp.* 1–9 *and* 16–22, *July*, 1942.—A simple laboratory method of studying the ascent of moisture and aqueous solutions through the soil is described. The effect of packing on the rate of upward movement is discussed; at max. packing the rate of movement is ⅓ of that at min. packing. The influence of various percentages of sand mixed with the black cotton soil in increasing the permeability and rate of upward movement of moisture is discussed. A small quantity of Li_2CO_3 or Na_2CO_3 reduces the rise of water. Li_2CO_3 is more efficient than Na_2CO_3. The swelling of the colloidal material in black cotton soils in solutions of a number of substances is described. Li_2CO_3 is the most efficient swelling agent. The effect of prolonged heating is to destroy the organic colloids covering the particles. This leads to the absence of swelling and a marked increase of permeability.

See Abstr. 82 532.696.1 : 532.733

See Abstr. 307 532.71 : 541.182.5 : 539.388.8

81 532.712 = 3

Significance and calculation of osmotic pressure. FREDENHAGEN, K. *Kolloid Z.*, 99, *pp.* 277–283, *June*, 1942.—Equations are derived for the molar transport energy between liquid phases and for the osmotic pressure difference, assuming that the substances are mutually indifferent, physically and chemically, and that they have equal mol-volumina. Only on these assumptions can the equality of the osm. pressure diff. and the thermic pressure exerted by the dissolved substance be proved. R. N.

82 532.733 : 532.696.1

Solubilization of water-insoluble dye in aqueous solutions of commercial detergents. MCBAIN, J. W. AND MERRILL, R. C., JR. *Industr. Engng Chem.*, 34, *pp.* 915–919, *Aug.*, 1942.—There is no connection between wetting power and solubilization. Heat increases the amount solubilized, as does the addition of salts in conc. where the detergent is not yet fully colloidal. In concentrated solutions, added salt decreases solubilization.

83 532.77

Changes in volume on mixing solutions. PARSONS, P. W., AND ESTRADA, F. J: *Industr. Engng Chem.*, 34, *pp.* 949–952, *Aug.*, 1942.—For practical operations that involve shrinkage and expansion of solutions on mixing, a simple and convenient method of calculation has been devised. By combining readily obtainable data into a shrinkage factor, the amount of actual vol. change can be computed quickly. Derivation and examples of the method are shown with special ref. to ethanol-water solutions. The fact that certain of these solutions actually expand on dilution has not been generally recognized hitherto. The relation to the established concepts of apparent vol. and partial vol. is discussed.

84 532.77 : 536.7

The interaction between rubber and liquids. II. The thermodynamical basis of the swelling and solution of rubber. GEE, G. *Trans. Faraday Soc.*, 38, *pp.* 276–282; *Disc.*, 282–284, *Aug.*, 1942.—[See Abstr. 1507 (1942)]. Using no arbitrary const. which cannot be related to experiment, temperature coeff. of solubility of the right order of magnitude are calculated.

85 533.15

Change of sign of the thermal diffusion factor. GREW, K. E. *Nature, Lond.*, 150, *p.* 320, *Sept.* 12, 1942.

See Abstr. 246 533.15 : 539.217.5

86 533.16 : 532.13 : 533.7

Frictional phenomena. I–II. GEMANT, A. *J. Appl. Phys.*, 12, *pp.* 530–537, *July, and pp.* 626–633, *Aug.*, 1941.—I. A general theory of viscous processes is given, which is valid for all 3 states, and a fundamental equation that can be used for the computation of any particular case is derived, and is illustrated in the flow of a gas or liquid betw. 2 parallel walls.—II. The kinetic theory of gases is used to obtain an explanation of the viscous forces within a gas and at its boundary wall. The extent to which theory agrees with experiment is shown; an explanation of the molecular air pump is given. G. E. A.

See Abstr. 86 533.7 : 532.13 : 533.16

SOUND. VIBRATIONS

87 534.1

Elastic waves and vibrations of thin rods. PRESCOTT, J. *Phil. Mag.*, 33, *pp.* 703–754, *Oct.*, 1942.—A mathematical analysis. E. R. A.

88 534.154 = 3

Photo-electric torsiograph. SPILLMANN, W. *Schweiz. Arch. angew. Wiss. Techn.*, 8, *pp.* 252–255, *Aug.*, 1942.—Two dissimilar masses connected by a light spring are connected to 2 concentric tubes each containing slits at 45° to the direction of the axis. The lighter of the 2 masses is directly coupled to a pulley driven from the shaft of an i.c. engine which is under test. A ring of electric lamps surrounds the two sets of slit-tubes and thus relative movement of the tubes varies the intensity of the light passing through the slits. The light is focused by a special mirror on the shaft and falls upon a photo-electric cell connected with a c.r. oscillograph. Details are given of the method of calibration and use of the instrument. A. C. W.

89 534.22 : 532.13

Propagation of sound in liquids and viscosity. SURYAN, G. *Indian J. Phys.*, 16, *pp.* 77–81, *April*, 1942.—An empirical relation, $v = G\eta^{\frac{1}{9}}$, is given between sound velocity (v) and viscosity (η) of liquids. The propagation of sound in liquids is discussed on the basis of energy transference between molecules. The relation $v \propto \sigma^{-9}$ between sound velocity and molecular diameter (σ) is deduced theoretically. Dispersion of acoustic velocity with frequency is shown to be true from the theory. The frequency range for dispersion is discussed.

See Abstr. 136 534.321.9 : 535.435

90 534.321.9 : 537.531 : 535.4 : 548 = 4

Effect of ultrasonic waves on the diffraction of X-rays by crystals. WEIGLE, J. *Helv. Phys. Acta*, 15, 4, *p.* 329, 1942.—The effect of stationary waves on the position of diffraction spots in X-ray diffraction diagrams has been verified by X-ray investigation of quartz crystals excited piezo-electrically. A. J. M.

91 534.321.9 : 537.531 : 535.4 : 548 = 4

Theory of the influence of ultrasonic waves on the diffraction of X-rays by crystals. WEIGLE, J., AND BLEULER, K. *Helv. Phys. Acta*, 15, 5, *pp.* 445–454, 1942.—Mathematical. Considers the effect on the Fourier lattice of crystal vibrations with piezo-electric amplitudes, and shows that the lattice points are made diffuse by an amount which is a function of the product of the amplitude and wavelength of the vibration. J. T.

92 534.373 : 534.833

Frictional phenomena. III–IV. GEMANT, A. *J. Appl. Phys.*, 12, *pp.* 718–734, *Oct.*, 1941.—III. The part played by viscous forces in the absorption of acoustic waves travelling freely in a gas along with that due to heat conduction by the gas gives sound-absorption coeff. which are, in nearly every case, too small. Kneser's theory of a relaxation time explains the divergence as due to intramolecular vibrations, and the absorption in air is reduced by humidity because the water molecules reduce the relaxation time of the air molecules and shift the max. absorption to higher frequencies.—IV. The principles of room acoustics are discussed, and the sound-absorbing property of materials is explained on the basis of viscous processes in the pores of the material. Two methods are described for determining experimentally the acoustical resistance of a material: (1) The flow resistance is compared with that of a glass capillary; the units are placed in series and the same current of air is sucked through both; the pressure differences between the ends of the units are $\propto$ the respective resistances; experiment gave 14×10^3 for insulite and 18×10^3 for celotex, in abs. units. (2) The velocity of the gas is measured by means of a chemical indicator; the method is not suitable for low-resistance material. The properties of absorbents are discussed in relation to room acoustics. G. E. A.

93 534.61 = 3

New hydrodynamic principle for measurement of sound. ZICKENDRAHT, H. *Helv. Phys. Acta*, 15, 4, *pp.* 322–324, 1942.—The sensitivity to sound of streams of liquids or gases can be used to determine the intensity of sounds. The decrease in velocity of the stream is related to the amplitude and frequency of the sound. The apparatus uses a specially constructed jet through which air streams under diminished pressure. The velocity is determined by a Pitot tube connected with a sensitive manometer. Very weak sounds can be detected with this apparatus. The method can be used for the measurement of ultrasonic waves. A. J. M.

See Abstr. 92 534.833 : 534.373

OPTICS

94 535.13

Non-linear optics. SCHRÖDINGER, E. *Proc. Roy. Irish Acad. A*, 47, *pp.* 77–117, *June*, 1942.—This is

the first of a series of papers in which the non-linear electrodynamics proposed by Born [Abstr. 487 (1934)] and developed by Born and Infeld [Abstr. 1875 (1934)] is further investigated and developed. Born's theory is outlined, and the mutual influence of light waves is dealt with on the basis of the theory. The structural scattering of light by a point charge is also considered. A. J. M.

See Abstr. 30 535.23 : 523.823

See Abstr. 31 535.23 : 523.823.4

95 535.241.43

A true-area photometric distribution curve. BENFORD, F. *J. Opt. Soc. Amer.*, 32, *pp.* 307–308, *May*, 1942.—Considering a vertical polar curve graticule, the lat., θ, being measured as usual from the S. Pole (downward vertical), the scale of θ remains uniform, but the scale of candles is varied in proportion to $\sqrt{\sin\theta}$. The result is a net on which polar curves of equal area correspond to equal lumens for sources symmetrical about a vertical axis. G. F. F.

96 535.242.62 : 535.733 = 3

Dependence of the visibility factor, determined by the flicker method, on the experimental conditions. LÜTHY, H. *Helv. Phys. Acta*, 15, 4, *pp.* 343–372, 1942.—Determinations of the visibility factor have been made by the flicker method, using a specially designed photometer head so that the conditions of measurement could be varied in a number of different respects. A set of conditions can be specified such that the visibility curve agrees within 5% of the international curve at all points within the range 520 to 650 mμ. The best criterion for the normality of an observer is not his yellow/blue ratio but his red/green ratio. J. W. T. W.

97 535.247.4

A photo-electric photometer for rapid grading of naval stores products. OSBORN, R. H. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 572–575, *July* 15, 1942.—Light is passed through the sample and a given filter and received on a cell connected to a micro-ammeter. The single readings are $\propto$ the ratio of the transmissions of a sample for light beams of 2 diff. colours, independently of separate standards. The inst. may also be used as a chemical colorimeter, to obtain tristimulus values of transparent samples. The theory, diagrams and constructional details, are given. E. H. W. B.

See Abstr. 145 535.247.4 : 535.642

See Abstr. 148 535.247.4 : 535.661.4

See Abstr. 189 535.3 : 537.531

See Abstr. 190 535.3 : 537.531 = 3

See Abstr. 240 535.314 : 539.388.8 : 539.216.1 = 3

98 535.317 : 526.918.5

Characteristics of wide-angle airplane-camera lenses. WASHER, F. E. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 233–246, *Sept.*, 1942.—The characteristics of a great variety of wide-angle lenses were studied to determine their suitability for the production of aerial photographs for use in mapping, and the results are presented. The rel. illumination in the focal plane was measured, using a method depending upon the determination of the light-transmitting area of the lens effective at diff. orientations of the lens. Determinations of resolving power were also made and showed considerable variation in performance with type of lens. The effect of basing the distortion values upon the calibrated focal length instead of the equiv. focal length was determined. A. E. T.

99 535.325-3

Ultra-violet dispersion of air. LOWERY, H. *Phil. Mag.*, 33, *pp.* 622–630, *Aug.*, 1942.—The dispersion of dry air over the range λ6 563–λ1 822 is determined by means of a prism used in conjunction with a diffraction grating and the results expressed by the Cauchy formula $(n-1)\times 10^7 = 2\,882{\cdot}2 + (13{\cdot}53/\lambda^2 \times 10^{-8}) + (0{\cdot}3\,064/\lambda^4 \times 10^{-16})$.

100 535.33

Corrections for residual impurity and background in spectrochemical analysis. CHOLAK, J., AND STORY, R. V. *J. Opt. Soc. Amer.*, 32, *pp.* 502–505, *Sept.*, 1942.

101 535.33.03 : 621.325.124

Multiple-electrode high-voltage arc for spectrographic analysis. OWSLEY, W. D., AND MCREYNOLDS, R. C. *Rev. Sci. Instrum.*, 13, *pp.* 342–345, *Aug.*, 1942.—An apparatus is described which provides arcing facilities for 12 samples without the necessity of removing the electrodes. The lower electrodes rotate during arcing. All controls for selecting the electrode pairs and for vertical and horizontal adjustment are insulated and are located outside a safety cage which must be completely closed before application of the h.v. is possible. Contamination is prevented by adequate ventilation.

102 535.336.2

Gas analysis with the mass spectrometer. HIPPLE, J. A. *J. Appl. Phys.*, 13, *pp.* 551–560, *Sept.*, 1942.

103 535.336.2

Some applications of mass spectrometric analysis to chemistry. RITTENBERG, D. *J. Appl. Phys.*, 13, *pp.* 561–569, *Sept.*, 1942.

See Abstr. 222 535.336.2 : 539.155.2

104 535.338.1 = 3

Continuous emission spectra of the rare gases. VOGEL, B. *Ann. Phys., Lpz.*, 41, 3, *pp.* 196–210, 1942.—The continuous spectra emitted by He, Ne, A, Kr and Xe, are investigated in a.c. and d.c. discharges at pressures between 10 and 70 mm. Hg and with currents of 100 mA, all quantitative measurements being carried out in a.c. discharges. The long-wave limits of their continua are found to be app. at 7 550 $\pm$ 80 Å, 7 450 $\pm$ 80 Å, 8 100 $\pm$ 100 Å, 8 250 $\pm$ 250 Å and 9 250 $\pm$ 250 Å. The curves depicting their intensity distributions in abs. units for wavelengths ranging from 6 600–4 000 Å, for Kr up to 2 000 Å (70 mm. Hg, 100 mA), are all similar with 3 to 4 max. The abs. intensity of the continua differs widely; for He, Ne and A, compared with the spectra of Kr and Xe of about equal intensity, it is in the ratio of 30 : 200 : 4. Within 20–150 mA the intensity distribution and the position of the max. of the continua of the heavy rare gases are independent of the current strength; the abs. intensity goes linearly with it. For the continua of A, Kr and Xe the max. are displaced towards the long waves with increasing pressure between 10 and 70 mm. Hg. The continua are interpreted as molecular continua. The properties of the gas discharges at pressures between 20 and 70 mm. are also studied. The electrode sputtering no

onger follows the rules which in general apply; Cu sputers least. The tendency of the positive column to contract increases with increasing atom. wt. of the gas, whereas the heating of the tube walls drops. H. G. S.

105 535.338.4

A new band-system of boron monoxide. SINGH, J. L. *Curr. Sci.*, 11, *pp.* 276–278, *July*, 1942.

106 535.338.4

On perturbations causing apparent convergence in the C_2 spectrum. GERÖ, L., AND SCHMID, R. F. *Phys. Rev.*, 62, *pp.* 82–83, *July* 1 *and* 15, 1942.

107 535.338.4

Band spectrum of manganese hydride, MnH. I. Structure of the λ5 677 and λ6 237 bands. NEVIN, T. E. *Proc. Roy. Irish Acad. A*, 48, *pp.* 1–42, *Aug.*, 1942.—The band spectrum of MnH is very complex. The strongest band is degraded to the violet and has its main head at λ5 677. It is the 0,0) band of a system, of which the weaker (0,1) band lies at λ6 237. The structure of the bands shows that they are due to a transition $^7\Pi \rightarrow {}^7\Sigma$. The bands are described and analysed. They consist of at least 30 branches. The $^7\Pi$ state is normal, but the lower rotational levels of all the components are considerably perturbed. Provisional values of the molecular constants of the $^7\Sigma$ state, which is the ground state of the molecules, are given as follows: $B''_e = 5{\cdot}6\,855$ cm.$^{-1}$, $r''_e = 2{\cdot}230 \times 10^{-8}$ cm. A. J. M.

108 535.338.42

Energy of dissociation of carbon monoxide. GAYDON, A. G., AND PENNEY, W. G. *Nature, Lond.*, 150, *pp.* 406–407, *Oct.* 3, 1942.

109 535.338.42

Influence of barrier dimensions on the vibrational spectrum of ethane. CHARLESBY, A. *Proc. Phys. Soc., Lond.*, 54, *pp.* 471–487, *Nov.*, 1942.—Recent investigations indicate the existence of a high-potential barrier. A sinusoidal shape is assumed, and to obtain agreement with thermal measurements a height of 3 000 cal./mole is required. The effect of a rectangular barrier on the energy levels is investigated. In this case a barrier of height 1 700 cal./mole and width 1·35 radians leads to energy levels similar to those predicted by the sinusoidal barrier. The energy levels for heavy ethane are deduced. The value previously deduced for the barrier height, 3 000 cal./mole, is only significant for a cosine form of variation.

110 535.343 : 535.51

The effect of polarized light on the absorption spectrum of the neodymium ion in crystals. KINSEY, E. L., AND KRUEGER, R. W. *Phys. Rev.*, 62, *p.* 82, *July* 1 *and* 15, 1942.

See Abstr. 191. 535.343 : 537.531

111 535.343 : 538.214 : 541.67

The configuration of organic co-ordination compounds of nickel, with especial reference to bis-formylcamphor-ethylenediamine-nickel. FRENCH, H. S., MAGEE, M. Z., AND SHEFFIELD, E. *J. Amer. Chem. Soc.*, 64, *pp.* 1924–1928, *Aug.*, 1942.—New data are presented on the visible and ultra-violet absorption spectrum of the Ni complex of formylcamphor-ethylenediamine and on its magnetic susceptibility in the solid state and in methyl alcohol solution. The configuration of the Ni complex is square co-planar in the solid state, but strained and twisted under the influence of the asymmetric camphor to such an extent that the Ni centre in methyl alcohol solution also is asymmetric and tends towards the tetrahedral configuration. New data are also presented for the magnetic susceptibilities of 5 other organic co-ordination compounds of Ni. New data are given for the absorption spectra in the visible and ultra-violet of bis-salicylaldehyde-nickel and bis-salicylaldehyde-propylenediamine nickel.

112 535.343.2 : 535.37 : 541.621

Isomers of crystal violet ion. Their absorption and re-emission of light. LEWIS, G. N., MAGEL, T. T., AND LIPKIN, D. *J. Amer. Chem. Soc.*, 64, *pp.* 1774–1814, *Aug.*, 1942.—The absorption of light by crystal violet has been studied under varying conditions and in numerous solvents. With resp. to the absorption curves, solvents may be placed in 3 classes, of which the first is typified by ethanol, the second by chloroform, and the third by toluene. All three types of curves show 2 absorption bands, which belong to 2 isomers of crystal violet ion, *A* and *B*, of which *B* has the higher energy by 580 cal. A theory of the nature of these stereoisomers is given. In solvents of Classes II and III (all of low dielectric const.) there is no appreciable number of free ions, but rather ion clusters [see *J. Amer. Chem. Soc.*, 55, 3614, 1933]. The fluorescent and phosphorescent emission from crystal violet was studied quantitatively. There is evidence of still another isomeric condition of crystal violet ion, when produced from a leuco-compound by illumination in a rigid solvent. This condition persists in the dark until the solvent is melted. H. H. HO.

113 535.343.2 : 535.375.54

The lattice and electronic spectrum of diamond. NAYAR, P. G. N. *Proc. Indian Acad. Sci. A*, 15, *pp.* 293–309, *May*, 1942.—The fluorescence and absorption spectra of diamond show a perfect mirror image symmetry about the sharp electronic band at 4 152 Å. They split up into discrete lines at liquid-air temperature. The discrete character of the lattice spectrum is inconsistent with the idea that the atomic oscillations in a simple crystalline solid are of the same physical nature as the vibrations of an elastic solid. The experimental results indicate that the absorption frequencies in the ultra-violet, as also a few additional weak lines appearing in the visible region, should be ascribed to the transitions betw. the electronic energy levels of the diamond structure. [See Abstr. 290 (1942)].

114 535.349

Illumination and visual range under water. POOLE, H. H. *Nature, Lond.*, 150, *pp.* 337–338, *Sept.* 19, 1942.

115 535.37

Properties of luminescent materials. BARNETT, C. E. *Industr. Engng Chem. News Bull.*, 20, *pp.* 1006–1009, *Aug.* 25, 1942. E. R. A.

116 535.37

The phosphorescence microscope. HARVEY, E. N., AND CHASE, A. M. *Rev. Sci. Instrum.*, 14, *pp.* 365–368, *Aug.*, 1942.—Four different methods of microscope observation of the phosphorescence of minute

structures in cells or cell products, or microcrystals, both organic and inorganic, are described. The material must be dry or nearly so and the illumination short ultra-violet such as occurs in condenser discharges in air or in Hg, or the Fe arc. Observations on various types of material, including tooth sections, are described.

See Abstr. 112 535.37 : 541.621 : 535.343.2

117 535.37 : 666.1

Fluorescence of glass. WEYL, W. A. *Industr. Engng Chem.*, 34, *pp.* 1035–1041, *Sept.*, 1942.—A classification of fluorescent glasses is suggested which arranges them according to the rôle played by the vitreous phase in producing fluorescence. The quenching of fluorescence in glass is also discussed.

E. R. A.

118 535.371

Fluorescence of manganese in glasses and crystals. LINWOOD, S. H., AND WEYL, W. A. *J. Opt. Soc. Amer.*, 32, *pp.* 443–453, *Aug.*, 1942.—The fluorescence is studied in different glasses and crystals under the following headings: The co-ordination of Mn; the fluorescence of Mn compared with the colour of Co; the influence of temperature; concentration quenching; fluorescence in crystals and the crystal chemistry of silicate phosphors containing divalent Mn; the green zinc orthosilicate phosphor; the red and yellow phosphor; the influence of imperfections in the crystal structure on the fluorescence of Mn. The similarity in the behaviour of Mn as an activator in glasses and crystals is also expressed in the influence of temperature. H. H. HO.

119 535.371 : 541.6

Visible fluorescence and chemical constitution of compounds of the benzopyrone group. III. Further study of structural influences in coumarins. BALAIAH, V., SESHADRI, T. R., AND VENKATESWARLU, V. *Proc. Indian Acad. Sci. A*, 16, *pp.* 68–82, *July*, 1942.—Dihydro-umbelliferone and its derivatives, which do not possess a pyrone double bond, do not fluoresce. Cyano- and phenyl-groups enhance fluorescence if in the 3-position in umbelliferone, but not if in the 4-position. No fluorescence occurs if the conjugation of double bonds is broken. The effect of the position of the hydroxyl group in the monohydroxycoumarins on the fluorescence is investigated. The 7-position is most effective, the 6- less, and there is no fluorescence if the group is in the 5- or 8-position. In the dihydroxy-coumarins the fluorescence of the 6 : 7-compound is greater than that of the 5 : 7, which in turn is greater than that of the 8 : 7-compound. Methylation causes a change in capacity and colour of fluorescence. A. J. M.

120 535.371 : 621.327.43

Luminous characteristics of two phosphorescent materials. TAYLOR, A. H. *J. Opt. Soc., Amer.*, 32, *pp.* 506–509, *Sept.*, 1942.—The materials studied are known as P-10 and P-11, of which the former shows a blue and the latter a green phosphorescence. Dark-adaptation data applicable to their use in artificially lighted interiors are tabulated. The Purkinje effect is found to be specially favourable to the blue material. Curves show their brightness decay after exposure to tungsten-filament lamps, a 3 500° white fluorescent (Mazda F) lamp, and a high-pressure Hg lamp with "black-light" filter. Values of their approx. brightness relative to visual threshold for various times after turning off the activating light are given in a second table. Their war-time use is pointed out. H. G. S.

121 535.375.5

Analysis of the Raman spectrum of single crystals of naphthalene. NEDUNGADI, T. M. K. *Proc. Indian Acad. Sci. A.*, 15, *pp.* 376–389, *May*, 1942.—Reports the results of study and evaluation of 24 spectrograms recorded for various settings of the crystal, and for various directions of vibration in the incident and scattered radiations. Polarization studies have revealed that some of the internal oscillations split up into symmetric and antisymmetric components.

122 535.375.5

The Raman spectra of organic compounds: aniline. VENKATESWARAN, C. S., AND PANDYA, N. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 390–395, *May*, 1942.—An intense human spectrum of aniline has yielded 39 lines. Thirty of these are assigned to the benzene ring.

123 535.375.5

The Raman spectra of organic compounds: diethyl disulphide. VENKATESWARAN, C. S., AND PANDYA, N. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 396–400, *May*, 1942.—The spectrum consists of 27 lines. Nine of these are observed for the first time. The results are discussed in relation to the problem of free rotation about the S–S bond. Six polarized lines are due to the *trans* and 12 to the *cis* forms.

124 535.375.5

The Raman spectra of organic compounds: binary liquid mixtures. VENKATESWARAN, C. S., AND PANDYA, N. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 401–405, *May*, 1942.—The spectra of cyclohexane–aniline and iso-butyric-acid–water, are obtained and compared with the spectra of the component liquids. No changes are observed in the cyclohexane–aniline mixture. From a comparison of these changes with those reported for formic, acetic and trichloroacetic acids, it is concluded that, at the critical temperature, the acid molecules change over from dimer to monomer state.

125 535.375.5

The fluorescence of the uranyl compounds and the Raman spectrum of the uranyl ion. SATYANARAYANA, B. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 414–416, *May*, 1942.—The spectrum of uranyl chloride consists of 3 lines having frequency shifts of 211 cm.$^{-1}$, 865 cm.$^{-1}$ and 909 cm.$^{-1}$. The intense line at 865 cm.$^{-1}$ is highly polarized and accompanied by a faint companion. The lowest frequency line at 211 cm.$^{-1}$ is also a doublet.

126 535.375.5

Effect of temperature on the intensities of Raman lines. II. Crystals. VENKATESWARLU, K. *Proc. Indian Acad. Sci. A*, 16, *pp.* 45–49, *July*, 1942.—[See Abstr. 1528 (1942)]. The effect at 155, 280, 710 and 1 085 cm.$^{-1}$ in calcite was studied. For all four lines there is a decrease in intensity with increase of temperature but the rate of decrease is more rapid in the case of lattice lines than in the case of the in

ernal lines. Placzek's theory regarding the dependnce of the intensities of the vibrational Raman lines n temperature is not in agreement with experimental esults.

127 535.375.5

Raman spectrum of 1,3,5-triphenyl benzene. MUKERJI, S. K., AND SINGH, L. *Nature, Lond.*, 150, . 347, *Sept.* 19, 1942.

See Abstr. 288 535.375.5 : 541.132

128 535.375.5 : 541.57

Raman effect and hydrogen bonds. V. Mixtures of cetic acid with ethers (dioxan and acetal). MURTY, J. V. L. N., AND SESHADRI, T. R. *Proc. Indian Acad. Sci. A*, 16, *pp.* 50–53, *July*, 1942.—Raman spectra of mixtures of acetic acid with donor solvents dioxan and acetal) not having C=O groups were studied. The results lend support to the mechanism described [Abstr. 2858 (1942)] of the progressive breakdown of the ring dimers of the acid into associates of the open dimers and eventually of the monomers with the solvent molecules. The extraordinary efficiency of water in bringing about the breakdown is attributed to its dual capacity to act as both donor and acceptor.

129 535.375.5 : 548

Raman spectra of crystals excited by the mercury resonance radiations. KISHORE, R. *Proc. Indian Acad. Sci. A*, 16, *pp.* 36–44, *July*, 1942.—The paper reports the results of a study of the Raman spectra in various single crystals, the 2 537 resonance radiations of a water-cooled quartz mercury arc being used for excitation. Quartz, barite, celestite, gypsum and witherite were studied.

130 535.375.54

The luminescence, absorption and scattering of light in diamonds. IV. Raman effect. NAYAR, P. G. N. *Proc. Indian Acad. Sci. A*, 15, *pp.* 310–315, *May*, 1942.—[See Abstr. 290 (1942)]. Records observations on the frequency, intensity and polarization of the Raman line of frequency shift 1 332 cm.$^{-1}$ in diamonds. The scattering has been considered as a monochromatic reflection by phase-waves, and the consequences are discussed. No change in the frequency within 1 in 1 000, nor any difference in intensity, was found by varying the setting of the crystal or the angle of scattering. The depolarization value was 1, in disagreement with the supposed theoretical value of 2. An irregularity of the spectral line in an imperfect crystal is illustrated, it is suggested that an intense local stress is responsible for this effect.

See Abstr. 113 535.375.54 : 535.343.2

131 535.376

The electromagnetic mechanism of the beta phosphorescence of fluorescein in acid solution. WEISSMAN, S. I., AND LIPKIN, D. *J. Amer. Chem. Soc.*, 64, *pp.* 1916–1918, *Aug.*, 1942.—A wide-angle interference study of the β-phosphorescence of fluorescein in H_3PO_4 at 95°K. has shown that the process involves an electric dipole transition.

See Abstr. 247 535.391 : [539.23 + 539.211

See Abstr. 90, 91 535.4 : 548 : 537.531 : 534.321.9 = 4

132 535.434 : 541.182.4

The scattering of light in emulsions. SINGH, D. *Proc. Indian Acad. Sci. A*, 15, *pp.* 406–413, *May*, 1942.—In dilute emulsions the light scattered in the transverse horizontal direction is in general elliptically polarized. The dependence of ellipticity on the inclination of the plane of polarization of the incident light to the vertical, the nature of the dispersed phase, the size of the droplets, the wavelength of the incident light and the angle of scattering, have been investigated in detail. In the case of conc. emulsions the scattered light is highly depolarized.

133 535.435

Interferometric studies of light scattering in mobile liquids. VENKATESWARAN, C. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 322–337, *May*, 1942.—A detailed study has been made of the spectral character of the monochromatic light in CCl_4, cyclohexane, ethyl ether, ethyl alcohol, water, iso-butyric acid, acetone, benzene, tetralin and phenol. Besides the 2 Brillouin components and an undisplaced central component, a continuum extending betw. these components is noticed. The displaced components are sharp and well defined for most of the liquids at the room temperature; they become broad when the temperature is raised to the b.p.

134 535.435

Interferometric studies of light scattering in the alcohols. BAI, K. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 349–356, *May*, 1942.—The spectral character of the so-called unmodified light scattering by 8 members of the aliphatic series of alcohols was examined, using a Fabry–Perot etalon and a Zn-Hg amalgam lamp as the source. The intensity of the central component relatively to the outer or displaced ones increases rapidly for the higher members of the series. The data are inconsistent with the suggestion that the central component represents the difference between the optical effects of density fluctuation calculated on an isothermal and adiabatic basis, respectively.

135 535.435

Interferometric studies of light scattering in viscous liquids and glasses. VENKATESWARAN, C. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 362–370, *May*, 1942.—Sharp and well-defined Brillouin components were recorded for glycerine and castor oil. The intensity of these components in glycerine shows a progressive increase as the temperature is raised from 0° to 110°C., the central undisplaced component indicating a corresp. diminution in intensity. The Brillouin components appear with great intensity in cyclohexanol and glycol which are relatively less viscous. No displaced components are observed in glucose and in styrol and optical glasses. While the velocity of the thermal sound waves calculated from the Brillouin displacement agrees with the ultrasonic velocity in cyclohexanol and glycol, it is considerably higher than the latter in glycerine and castor oil.

136 535.435 : 534.321.9

Interferometric studies of light scattering: hypersonic velocities in liquids. VENKATESWARAN, C. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 371–375, *May*, 1942.—The "hypersonic" velocities for 18 representative liquids are calculated from the Brillouin displace-

ments in the light scattered by these liquids. The data are compared with those obtained by the ultrasonic method. No detectable dispersion of velocity has been observed.

137 535.435 : 535.51

Interferometric studies of light scattering in liquids: Polarization data. BAI, K. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 357–361, *May*, 1942.—The states of polarization of the central component and the Brillouin components in light scattering were investigated for a series of 4 fatty acids and 4 other organic liquids, using a Lummer plate. While the 2 Brillouin components are strongly polarized in transverse scattering, the central component showed a marked defect of polarization for all the liquids. This imperfection depends on the temperature.

138 535.435 : 536.7

The scattering of light in liquids. BAI, K. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 338–348, *May*, 1942. —A general expression for the intensity of scattered light is derived from thermodynamic principles assuming that the whole of the scattering process is (1) isothermal and (2) adiabatic. The abs. intensities of light scattered by 10 iquids have been determined. The observed data were nearer the adiabatic than the isothermal values, though they were slightly higher than the former.

139 535.436

Interferometric studies of light scattering in gases. VENKATESWARAN, C. S. *Proc. Indian Acad. Sci. A*, 15, *pp.* 316–321, *May*, 1942.—Light scattered backwards by H_2, N_2, O_2 and CO_2 at h.p., has been analysed by a Fabry–Perot interferometer. None of the gases showed displaced components. For the heavier gases, the Doppler broadening was too small to be detectable with Hg radiations. The pattern for H_2 showed a broadening and the $\frac{1}{2}$-breadth of the line was of the order to be expected from Maxwell's distribution law. A weak background due to molecules having relatively high velocities was observed in the scattered patterns for all cases.

See Abstr. 110 535.51 : 535.343

See Abstr. 137 535.51 : 535.435

140 535.515 = 3

Experiments for explaining the slope of experimental double-refraction curves. PFEIFFER, H. H. *Kolloid Z.*, 99, *pp.* 259–262, *June*, 1942.

See Abstr. 241 535.515 : 539.388.8 : 539.216.1 = 3

141 535.542.1

Plastic wedge compensator. PIECEWICZ, C. T. *Rev. Sci. Instrum.*, 13, *pp.* 296–297, *July*, 1942.

142 535.563

Optical rotatory dispersion of (—)tetrahydrofurfuryl alcohol. AIRS, R. S., BALFE, M. P., IRWIN, M., AND KENYON, J. *J. Chem. Soc.*, *pp.* 531–532, *Sept.*, 1942.—A 2-term Drude equation is given which fits the rotatory dispersion of (—)tetrahydrofurfuryl alcohol [see Abstr. 1809 (1941)].

143 535.563

Optical activity of some cinchona alkaloids and some of their salts. ANDREWS, J. C. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 543–545, *July* 15, 1942.—Data are recorded showing the variation in optical activity in progressively varied mixtures of water and ethyl alcohol of the free base, the sulphate and the dihydrochloride, as well as the change in optical activity as the free base is progressively neutralized with H_2SO_4 and HCl. Studies were made on quinidine, dihydroquinidine, cinchonine and cinchonidine.

144 535.612

Brightness of light sources. FORSYTHE, W. E., AND WATSON, E. M. *Gen. Elect. Rev.*, 45, *p.* 402, *July*, 1942.—A correction. [See Abstr. 2593 (1941)].

145 535.642 : 535.247.4

Photo-electric tristimulus colorimetry with three filters. HUNTER, R. S. *J. Opt. Soc. Amer.*, 32, *pp.* 509–538, *Sept.*, 1942.—A comprehensive treatise on a 3-filter method of photo-electric tristimulus colorimetry, which has so far been chiefly used with the author's multi-purpose photo-electric reflectometer [Abstr. 98 (1941)]. Although mainly devised for surface colour, many of the methods suggested are applicable to volume colours by measurements of transmitted energy and of illuminant colours by measurements of emitted energy. The subject-matter is dealt with under: Source-filter photocell combinations. Reduction of photo-electric tristimulus data to (1) I.C.I. values, (2) (α, β) uniform-chromaticity-scale co-ordinates, (3) amount of colour difference perceived betw. surface colours, (4) co-ordinates of a solid with approx. uniform colour-perception spacing, (5) hue angle, saturation index and brightness index, (6) estimates in N.B.S. units of hue, saturation and lightness components of a perceived surface-colour difference, (7) whiteness values, and (8) yellowness of a white and near-white surface. Standards for photo-electric tristimulus colorimetry. Errors in measurements caused by (1) chromaticity-difference due to spectral inaccuracy of the combinations of source, filter and photocell, (2) chromaticity changes resulting from change of photo-cell in an instrument, (3) fluorescence, and (4) short cuts in computation. Relation of perceptual impressions and measured values of colour. The measurements may prove of commercial use in controlling colours of materials in production, complying with colour-tolerance requirements, modifying colour to give matches, and measuring colour changes accompanying fading. There are 51 references.

H. G. S.

146 535.653.8

Fundamental criterion of uniform representability of equiluminous colours on a geometrical surface. SILBERSTEIN, L. *J. Opt. Soc. Amer.*, 32, *pp.* 552–556, *Sept.*, 1942.—Defining any 2 colours just distinguishable from each other as "neighbours," the author examined the deductions which can be made from the number of neighbours on the locus of all the neighbours surrounding (on the colour chart) any one particular colour. If, and only if, this number is const. for all colours, can a colour diagram with uniform chromaticity scale be drawn on a surface of const. curvature and, further, only if this number is 6 will the curvature be zero, i.e. the colour diagram will be developable upon a plane. The author urges that the number should be determined experimentally for as many colours as practicable.

J. W. T. W.

147 535.653.85

Attributive limens in selected regions of the Munsell colour solid. BELLAMY, B. R., AND NEWHALL, S. M. *J. Opt. Soc. Amer.*, 32, *pp.* 465–473, *Aug.*, 1942.—Difference limens for hue, value and chroma numbering approx. 500 have been determined by 3 observers during a period of 2 years for points located throughout the volume of the Munsell colour solid. On the basis of these results, mean determinations have been computed for 41 representative regions of the solid. The method and conditions of observation are described in detail, and representative data are tabulated and discussed. The hue limens appeared to be particularly high in the blue and particularly low in the purple. The chroma limens exhibit a regular increase in magnitude with increase in chroma, while the value limens are relatively regular and small. The optimum period of adaptation for chroma discrimination is less than for value discrimination. This suggests a fundamental difference in the two quantitative dimensions of colour sensation. A. W.

148 535.661.4 : 535.247.4

Photo-electric colour. DILLER, I. M., GRAY, R. J., DE, AND WILSON, J. W., JR. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 607–614, *Aug.* 15, 1942.—Photo-electric colour is a new system for the measurement of the colour of lubricating oils. The colour is measured directly in technologically significant terms. Only 2 readings are required: brilliance and characterization of the hue. The system uses a photo-electric colorimeter, designed for accuracy and easy standardization. The colorimeter has a continuous scale from 1 to 100 for the definition of the intensity.

See Abstr. 96 535.733 : 535.242.62 = 3

149 535.733.1

Development of the trichromatic theory of colour vision. PEDDIE, W. *Phil. Mag.*, 33, *pp.* 559–575, *Aug.*, 1942.—After pointing out that the trichromatic theory is, in itself, entirely independent of any theory of the mechanism by which colour vision is brought about, the author examines the bases upon which the theory has been built, viz. Newton's and Abney's laws, the Weber–Fechner law and its extension by Helmholtz and finally the Pauli–Schrödinger development. The application to anomalous colour vision is explained and the theory is illustrated by means of an electrical circuit analogy. J. W. T. W.

150 535.755 = 3

Colour-blind spot in an otherwise normally colour-sensitive retina. BESSO, M. *Helv. Phys. Acta*, 15, 4, *pp.* 334–335, 1942.—A physiological effect is described. A. J. M.

151 535.767

Shape of subjective space. COX, S. M. *Nature, Lond.*, 150, *p.* 349, *Sept.* 19, 1942.

See Abstr. 192 535.826 : 537.533.72

HEAT. THERMODYNAMICS

152 536.212.08

The measurement of the thermal conductivity of materials used in building construction. GRIFFITHS, E. *J. Instn Heat. Vent. Engrs*, 10, *pp.* 106–138, *Aug.–Sept.*, 1942.—Apparatus is described which has been developed at the N.P.L. for the measurement of thermal conductivity of building materials and some test results are given and discussed. E. R. A.

153 536.212.2

The temperature distribution around a spherical hole in an infinite conducting medium. PUGH, H. L. D., AND HARRIS, A. J. *Phil. Mag.*, 33, *pp.* 661–666, *Sept.*, 1942.—The boundary conditions are that heat flows from the medium through the surface of the hole at a rate $\propto$ the surface temperature, and that there is no flow of heat at infinity.

154 536.247

Mean temperature difference in an array of identical exchangers. GARDNER, K. A. *Industr. Engng Chem.*, 34, *pp.* 1083–1087, *Sept.*, 1942.—A general relation is given betw. the mean-temperature-difference correction factor for an array of identical exchangers and that for a component exchanger. A complete solution is given for 3 common flow arrangements.

See Abstr. 203 536.413 : 669.018 : 538.082

155 536.413.3

The thermal expansion of aluminium: further experiments. WILSON, A. J. C. *Proc. Phys. Soc., Lond.*, 54, *pp.* 487–491, *Nov.*, 1942.—It is found that the double curvature [Abstr. 1037] is characteristic of unannealed filings. After the filings have been heated above 600°C. it disappears.

156 536.413.3 : 679.5

Transition temperature and cubical expansion of plastic materials. WILEY, F. E. *Industr. Engng Chem.*, 34, *pp.* 1052–1056, *Sept.*, 1942.—[Abstr. 460 B (1943)].

See Abstr. 50 536.42 : 531.19

157 536.423.15 : 518.3

Vapour-pressure nomographs for aq. sodium hydroxide solutions. DAVIS, D. S. *Industr. Engng Chem.*, 34, *pp.* 1131–1132, *Sept.*, 1942.

See Abstr. 166 536.423.15 : 536.655

See Abstr. 171 536.44 : 536.712

158 536.45

Luminous radiation from hot gases. DAVID, W. T. *Nature, Lond.*, 150, *pp.* 291–292, *Sept.* 5, 1942.

159 536.46

Radiation from flames. DAVID, W. T. *Nature, Lond.*, 150, *pp.* 407–408, *Oct.* 3, 1942.

160 536.461

Abnormality of flame gases. DAVID, W. T. *Nature, Lond.*, 150, *pp.* 320–321, *Sept.* 12, 1942.

161 536.531 : 621.317.794

Attenuated superconductors. I. For measuring infra-red radiation. ANDREWS, D. H., BRUCKSCH, W. F., JR., ZIEGLER, W. T., AND BLANCHARD, E. R. *Rev. Sci. Instrum.*, 13, *pp.* 281–292, *July*, 1942.—[Abstr. 114 B (1943)].

162 536.631

High-temperature heat content of Mn_3O_4, $MnSiO_3$ and Mn_3C. SOUTHARD, J. C., AND MOORE, G. E. *J. Amer. Chem. Soc.*, 64, *pp.* 1769–1770, *Aug.*, 1942.—The heat contents to temperatures betw. 1 140° and 1 500° are determined, disclosing transitions of Mn_3O_4 at 1 172° and Mn_3C at 1 037°.

163 536.631

Heat of formation and high-temperature heat content of manganous oxide and manganous sulphate. High-temperature heat content of manganese. SOUTHARD, J. C., AND SHOMATE, C. H. *J. Amer. Chem. Soc.*, 64, *pp.* 1770–1774, *Aug.*, 1942.—The heat contents of manganese, manganous oxide and manganous sulphate to temperatures betw. 811° and 1 500° are determined, disclosing a transition in manganese at 739°.

164 536.631 : 537.226.2 : 538.22 : 548 = 3

Specific heat of Rochelle-salt series. Dielectric measurements on KD_2PO_4 crystals. BANTLE, W. *Helv. Phys. Acta*, 15, 4, *pp.* 373–404, 1942.—Measurements were made of the anomalies of sp. ht. of the series KH_2AsO_4, KH_2PO_4 and KD_2PO_4 at the upper Curie point. The total anomalous heat consumption was measured and from this the Lorentz factor of the internal field was calculated. The production of KD_2PO_4 crystals is described in detail. Measurements were made of the dielectric const. of these crystals both in the *c*- and *a*-direction. The upper Curie point, which is 123°K. for KH_2PO_4, is raised about 90° when D_2 is substituted for H_2. Braun-tube hysteresis measurements on KD_2PO_4 crystals gave the saturation polarization, the remanence, coercivity and losses as a function of temperature. At the so-called lower Curie point these crystals behave differently from Rochelle salt. This is explained by the fact that at low temperatures the spontaneous polarization of Rochelle salt disappears. At the lower Curie point KD_2PO_4 exhibits no anomalies of the sp. ht. A. W.

165 536.631 = 4

Anomaly in the specific heat of ammonium chloride. EXTERMANN, R., AND WEIGLE, J. *Helv. Phys. Acta*, 15, 5, *pp.* 455–461, 1942.—Measurements with a special calorimeter on large crystals in the region − 25° to − 45° confirm a marked anomaly at the transition point near − 30°. A hysteresis effect in the internal energy, analogous to the expansion hysteresis, is plotted and described. N. M. B.

166 536.655 : 536.423.15

Correlating vapour-pressure and latent-heat data. OTHMER, D. F. *Industr. Engng Chem.*, 34, *pp.* 1072–1078, *Sept.*, 1942.—A simple equation relates reduced pressures and lat.-ht./critical-temp. of any given material to those of a reference substance, always taken at the same reduced temperature: $\log P_R/\log P'_R = L_R/L'_R$. The equation also gives exact plots and entirely eliminates the slight curvatures in the critical regions of the lines of the log plot for expressing the v.p. function. The interconversion of reduced and usual values of temperatures and pressures may be made graphically by nomograms. [See Abstr. 2491 (1940)].

See Abstr. 308 536.658 : 541.183.26

167 536.66

Heats of organic reactions. XIII. Heats of hydrolysis of some acid anhydrides. CONN, J. B., KISTIAKOWSKY, G. B., ROBERTS, R. M., AND SMITH, E. A. *J. Amer. Chem. Soc.*, 64, *pp.* 1747–1752, *Aug.*, 1942.—[See Abstr. 2865 (1942)].

See Abstr. 84 536.7 : 532.77

See Abstr. 138 536.7 : 535.435

168 536.7 : 539.31

Thermodynamic study of the elastic extension of rubber. TRELOAR, L. R. G. *Trans. Faraday Soc.*, 38, *pp.* 293–298; *Disc.*, 298, *Aug.*, 1942.—The internal energy and entropy changes taking place when rubber is stretched may be determined by a study of the variation of tension with temperature or by measurement of the heat evolved.

169 536.7 : 541.132

A thermodynamic study of bivalent metal halides in aqueous solution. VII. The activity coefficient of barium bromide at 25°. ROBINSON, R. A. *Trans. Faraday Soc.*, 38, *p.* 447, *Oct.*, 1942.—Errata. [Abstr. 417 (1941)].

170 536.7 : 541.132

A thermodynamic study of bivalent metal halides in aqueous solution. IX. The activity coefficients of some alkaline earth metal bromides and iodides. ROBINSON, R. A. *Trans. Faraday Soc.*, 38, *pp.* 445–446, *Oct.*, 1942.—[See Abstr. 417, 1874 (1941)]. The activity coeff. of 5 alkaline earth metal bromides and iodides have been determined from isopiestic measurements at 25°.

See Abstr. 305 536.7 : 541.182 = 3

171 536.712 : 536.44

An equation for the isotherms of pure substances at their critical temperatures. MEYERS, C. H. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 157–176, *Aug.*, 1942.—An empirical equation is presented for data along the isotherms of pure substances at their critical temperatures and densities up to 1·1 times the critical density. The equation has 5 consts. in addition to the universal gas const. Exp. data for the following substances are compared with calculated data—H_2, O_2 and N_x, methane, ethane, propane, CO_2, propylene, butane, ethyl ether, heptane, NH_3 and H_2O. Apart from the case of water, the equation given represents the data for these substances within the experimental error. A. E. T.

See Abstr. 173 536.77 : 537.221

ELECTRICITY. MAGNETISM

172 537.213 : 575

Green's functions in biological potential problems. WEINBERG, A. M. *Bull. Math. Biophys.*, 4, *pp.* 107–115, *Sept.*, 1942.—Electrical-potential problems of biology differ from those usually considered, because the membranes of tissues satisfy a non-linear relation between current flow and polarization, and because the interior of the tissues are not equipotentials. A Green's function suitable for discussing such problems is defined, and a cylindrical illustration of such a function is discussed.

173 537.221 : 536.77

Contact potentials. VII. Chemical and thermal effects. CHALMERS, J. A. *Phil. Mag.*, 33, *pp.* 608–613, *Aug.*, 1942.—The chemical and thermal origins of contact p.d.'s are discussed. Contact p.d.'s are discussed in terms of enthalpy differences instead of p.d. The enthalpy difference for a complete system is made up of external and internal enthalpy differences. Whereas the external enthalpy diff. is the same as the external p.d., this is not the case for internal enthalpy differences. The effects of concentration are thermal rather than chemical. A. J. M.

174 537.221 : 541.13

Contact potentials. V. The metal-electrolyte Volta effect. CHALMERS, J. A. *Phil. Mag.*, 33, *pp.* 594–598, *Aug.*, 1942.—In addition to the external p.d. at the metal/electrolyte boundary, there is another at the electrolyte/air boundary which amounts to about 0·26 V. Its experience is confirmed by experiments on the cell Cu | moist filter paper | air | H_2O | Cu, and on the Ag–$AgNO_3$ potential. It is possibly due to orientation of H_2O molecules. A. J. M.

175 537.221 : 541.134

Contact potentials. VI. Single potential differences. CHALMERS, J. A. *Phil. Mag.*, 33, *pp.* 599–608, *Aug.*, 1942.—Methods of determining single p.d.'s and the results obtained are discussed. Consistent interpretation of the results in the case of Hg/acid boundaries can be obtained by assuming an extra boundary at a Hg/acid surface, and the electrolyte/air p.d. of about 0·25 V. Results for Ga and amalgams are discussed. A. J. M.

176 537.226

Dielectric relaxation as a chemical rate process. KAUZMANN, W. *Rev. Mod. Phys.*, 14, *pp.* 12–44, *Jan.*, 1942.—The theory of dielectric relaxation is considered and compared with experimental results. Evidence for the existence of distribution of relaxation rates is summarized. The observed data on relaxation rates are discussed in terms of molecular processes, such as viscosity, conductance and entropy of activation. Relaxation in solids and in polymers is also considered, and the factors determining distribution of relaxation rates are briefly discussed. A. J. M.

177 537.226 = 3

Dielectric determinations with potassium phosphate, KH_2PO_4, and potassium arsenate, KH_2AsO_4, at low temperatures. BUSCH, G., AND GANZ, E. *Helv. Phys. Acta*, 15, 5, *pp.* 501–508, 1942.—Dielectric const. and the dielectric loss of KH_2PO_4 and KH_2AsO_4 have been determined in the temperature range of liquid H_2. The Curie temperatures are 123·5°K. for KH_2PO_4 and 96·5°K. for KH_2AsO_4. The dielectric hysteresis was investigated. The effective dielectric const. are approx. const. at temperatures below the Curie point, but decrease rapidly at temperatures between 70° and 50°K. for KH_2PO_4 and 75° and 60°K. for KH_2AsO_4. The max. of the dielectric loss occurs in the same range, and amounts to 3 joules per cm.[3] A. J. M.

178 537.226.2 : 532.133 : 539.41 = 3

Dielectric measurements on bituminous substances. III. WALTHER, H. *Kolloid Z.*, 99, *pp.* 302–314, *June*, 1942.—By varying the components of bituminous substances (pitch and tar-oil) and determining the dielectric-const./temperature curves, it was possible to predict the dissolving and swelling properties and the reactions to mechanical deformation. The relations betw. the dispersion range of these curves and wetting, displacement and adhesion effects of bituminous protecting films are discussed. A simple quantitative relation was found between dielectric const. and abs. viscosity in the range of low and medium viscosities. R. N.

See Abstr. 164 537.226.2 : 538.22 : 548 : 536.631 = 3

179 537.226.2 : 541.67 : 532.133

The dielectric investigation of polypeptides. II. The dispersion of simple amino acid polypeptides. CONNER, W. P., AND SMYTH, C. P. *J. Amer. Chem. Soc.*, 64, *pp.* 1870–1878, *Aug.*, 1942.—[See Abstr. 2615 (1942)]. An apparatus was constructed for the measurement of the dielectric const. of liquids at wavelengths from 40 to 80 cm. by the first Drude method. The dielectric const. of aq. solutions of 10 amino acid peptides in this region of anomalous dispersion have been measured, as have the viscosities of the solutions. Although the results are not inexplicable in terms of internal rotation around valence bonds in the molecules, the values and their trend are consistent with the simple picture of rotation of the molecule as a whole.

180 537.228.1

The vibration of piezo-electric plates. LAWSON, A. W. *Phys. Rev.*, 62, *pp.* 71–76, *July 1 and 15*, 1942.—The characteristic frequencies of infinite piezo-electric plates vibrating between the earthed electrodes of a plane-parallel capacitor have been rigorously investigated. The frequencies depend on the piezo-electric as well as the elastic const. of the crystal. The effective elastic const. do not satisfy the same symmetry relations as the true elastic const. For odd harmonics, which are the only modes which can be excited by a uniform electric field, the strain does not vanish at the surface of the plate for a finite gap between the electrodes. Consequently, the frequencies of free vibration also depend on the separation of the electrodes, and the rigorous theory shows this dependence should not be linear as hitherto supposed. The effect of the gap decreases as the (harmonic number)^2.

See Abstr. 58 537.228.1 : 531.787.9

181 537.228.4 = 3

Spontaneous Kerr effect with KH_2PO_4 and KH_2AsO_4 crystals. BANTLE, W., BUSCH, G., LAUTERBURG, B., AND SCHERRER, P. *Helv. Phys. Acta*, 15, 4, *pp.* 324–325, 1942.—The problem in connection with piezo-electric substances of the above type at the lower Curie temperature, viz. the apparent disappearance of the spontaneous polarization owing to the decrease of dielectric const., and the contradiction of this by sp. ht. determinations, is considered. The contradiction can be explained by supposing that the spontaneous polarization does not disappear, but the possibility of passing from the $+c$ to the $-c$ axis vanishes. The sudden decrease in double refraction that occurs at the upper Curie point does not occur at the lower Curie point. A. J. M.

182 537.311.33 : 621.315.56

The electric resistance and anisotropy of artificial graphite between 290°K. and 12°K. GOETZ, A., AND HOLSER, A. *Trans. Electrochem. Soc.*, 82, *Prepr. No.* 7, *Oct.*, 1942.—The electrical resistivity of artificial graphite is determined between room temperature and about 12°K. on rods cut parallel and normal to the extrusion direction of the sample material. The temperature ranges continuously explored were 295°K. to 130°K.; 90°K. to 65°K.; and 20°K. to 11°K. In the transversal direction the resistivity is about twice as large as in the longitudinal; this ratio changes

but little with temperature. The temperature coeff. of the resistivity is positive. E. R. A.

183 537.312.62 : 539.155.2 = 3

Experiments on the effect of the isotope composition on the electrical resistance and supraconductivity of lead. JUSTI, E. *Phys. Z.*, 42, 19–20, *pp.* 325–327, 1941.—The two samples tested were normal Pb of atom. wt. 207·21 containing 1·5% Pb^{204}, 23·6% Pb^{206}, 22·6% Pb^{207} and 52·3% Pb^{208}, and uranium Pb of atom. wt. 206·03 containing 93·3% Pb^{206} and 4·9% Pb^{207} and practically free from other isotopes. The methods of measuring the electrical resistance and the supraconductivity are explained. The residual resistance of both samples is extremely small and the higher resistance of the uranium Pb by 0·83% at 20·4° abs. and 0·88% at 78·4° abs. is attributable to its resistance dropping rather more slowly than that of ordinary Pb. It is shown that uranium Pb also becomes supraconductive, and that the discontinuity curves of the two varieties, both for heating and cooling, are identical. The transition normal-conducting $\rightleftarrows$ supraconducting could be effected so gradually as to preclude any but very minute differences in the discontinuity curves. H. G. S.

184 537.52 = 3

On the electrical breakdown in gases. RAETHER, H. *ETZ [Elektrotechn. Z.]*, 63, *pp.* 301–303, *July* 2, 1942. *Abstr. in Wireless Engr*, 19, *p.* 523, *Nov.*, 1942.—Discussion of results of cloud-chamber investigations: criterion for occurrence of discharge, and explanation of the much shorter building-up times for large pressure × distance values, etc. E. R. A.

185 537.523.4 : 621.3.015.5 : 621.315.618.9 = 3

The electrical behaviour of electronegative gases. WEBER, W. *Arch. Elektrotechn.*, 36, *pp.* 166–180, *March* 31, 1942.—[Abstr. 60 B (1943)].

186 537.523.4 = 82

An investigation of impulse spark discharges. I. The question of leader velocities. KOMEL'KOV, V. S. *J. Techn. Phys., U.S.S.R.*, 17, 10, *pp.* 1426–1433, 1940. *Abstr. in Wireless Engr*, 19, *p.* 523, *Nov.*, 1942.—In damped impulse spark discharges, a leader and a main channel in the discharge has been observed. A detailed experimental investigation was undertaken by the author, in which the discharge between 2 needles was studied for a negatively polarized incident wave (1/300 μs). E. R. A.

187 537.525.5

The mercury arc cathode. SMITH, C. G. *Phys. Rev.*, 62, *pp.* 48–54, *July* 1 *and* 15, 1942.—Conduction electrons in the liquid at the arc spot are considered to be heated to about 4 000°K. by electronic bombardment from the vapour while the atomic temperature of the liquid is near 150°C. Thermionic emission apparently yields the arc current plus that returning from the vapour. An arc spot was driven around a circular mercury track by a radial magnetic field. The spot travelled opposite to the ponderomotive force for fields below approx. 5 000 gauss with velocity proportional to field strength and showed a negative temperature coefficient. The Righi–Leduc effect considered as a thermomotive force operative in the hot layer of conduction electrons was assumed to drive the spot. The velocity was evaluated in terms of the vertical thermal gradient and compared with the observed, yielding a gradient of about 5×10^8 deg. cm. Arcs were extinguished by current pulses of about 10^{-7} sec. in the same direction as the arc current. The Thomson heat stops losses along this gradient and is apparently the factor causing the characteristic arc current density.

188 537.531

Investigation of the X-radiation from Te^{121} (125 days) by critical absorption and fluorescence. O'NEAL, R. D., AND SCHARFF-GOLDHABER, G. *Phys. Rev.*, 62, *pp.* 83–84, *July* 1 *and* 15, 1942.

189 537.531 : 535.3

A summary of X-ray satellites. HIRSH, F. R., JR. *Rev. Mod. Phys.*, 14, *pp.* 45–54, *Jan.*, 1942.—A survey of the past history and present position of work on X-ray satellites. The origin of and relationship between the Wentzel–Druyvesteyn theory, the Richtmyer theory and the theory of Coster and Kronig are fully discussed. J. T.

190 537.531 : 535.3 = 3

The intensity relations of the *K*-series lines of the heavy elements Re^{75} to Pb^{82}. VOTH, G. *Ann. Phys., Lpz.*, 41, 5, *pp.* 375–408, 1942.—The investigation is carried out by 3 different absorption methods [Abstr. 3847 (1931), 3042 (1928) and 3645 (1933)], and corrections are introduced to allow for the fact that 2 elements which absorb equally intensely in their *L*-branches must absorb with unequal intensity in their *K*-branches because of the drop in the magnitude of the *K*-jump with increasing atomic number. The results for $E_{\alpha\alpha'}/E_{\beta\gamma}$ accord with those of Grothey [Abstr. 2265 (1936)] between Co^{27} and Te^{52}. All the results can be represented as a function of the atomic number. The intensity relations of the individual *K*-series lines to the $K\alpha$-line are obtained as mean values from the observations on the different elements and are in agreement with previous data [Abstr. 91 (1921)] for the *K*-series of W. H. G. S.

191 537.531 : 535.343

The absorption spectra and the X-ray examination of the isomeric glucononitriles. PAPÀDAKIS, P. E. *J. Amer. Chem. Soc.*, 64, *pp.* 1950–1953, *Aug.*, 1942.—The 2 forms of glucononitrile, A and B, melting at 145° and 120·5°, respectively, shown by earlier work to differ in their optical activity, exhibited, within the accuracy of the measurements, the same X-ray powder diffraction spectra, but different ultra-violet absorption spectra. The (ultraviolet) spectrum also underwent complex changes with time.

See Abstr. 90, 91 537.531 : 535.4 : 548 : 534.321.9 = 4

192 537.533.72 : 535.826

Electron and optical microscope interpretation of the wall of *Pleurosigma angulatum*. HAMLY, D. H., AND WATSON, J. H. L. *J. Opt. Soc. Amer.*, 32, *pp.* 433–442, *Aug.*, 1942.—It has been found possible to explain the apparently contradictory observations of former workers, whose different results should be regarded as due to differences of observation conditions. The results now obtained indicate that the wall of *P. angulatum* is a ridged structure with rows of elliptic apertures about $0·3\ \mu \times 0·15\ \mu$, which are

usually spaced equilaterally 0·7 μ apart. In certain specimens these apertures are stopped by a thin diaphragm pierced by small holes about 0·04 μ in dia., separated by 0·02 μ. These dimensions are within the resolving-power limits of the electron microscope but far beyond those of the optical microscope. The work carried out shows that a proper understanding of small, transparent, 3-dimensioned structures in the size range 0·1 to 1·0 μ cannot be obtained by observation of single high-power photomicrographs, but must be built up by the use of as wide a variety of visual information as possible.

A. W.

193 537.533.72 : 621.385.833

Variation of the axial aberrations of electron lenses with lens strength. RAMBERG, E. G. *J. Appl. Phys.*, 13, *pp.* 582–594, *Sept.*, 1942.—[Abstr. 162 B (1943)].

194 537.533.73

Habit and orientation in electron diffraction. JOHNSON, R. P., AND GRAMS, W. R. *Phys. Rev.*, 62, *pp.* 77–79, *July* 1 *and* 15, 1942.—Electron diffraction patterns of etched W surfaces indicate a preferred orientation of the crystallites, with [100] $\perp$ surface. Actually, the etching leaves, on grains of a certain orientation, a structure exceptionally favourable for diffraction, and these selected grains dominate in the scattering. Analogous examples of weighted sampling, rather than random sampling, appear in studies of clays and of graphite. Crystal habit may frequently replace preferred crystal orientation as the cause of arcing in reflection patterns.

195 537.533.73 : 621.318.23

A permanent-magnet β-ray spectrograph. PLESSET, E. H., HARNWELL, G. P., AND SEIDL, F. G. P. *Rev. Sci. Instrum.*, 13, *pp.* 351–361, *Aug.*, 1942.—[Abstr. 117 B (1943)].

196 537.533.8

Proton production by electron collisions in molecular hydrogen. NEWHALL, H. F. *Phys. Rev.*, 62, *pp.* 11–18, *July* 1 *and* 15, 1942.—A mass spectrometer was used for the analysis. The electron beam, along which ions were produced, was co-axial with a cylindrical conductor, and the radial field within this conductor due to the electron space charge was used as an energy selector for the ions. The ions measured were those moving initially at rt. angles to the electron beam. The fast protons found by Bleakney were observed, and a rough measurement of the cross-section for their production was made. No evidence was found for the slow protons.

197 537.533.9 = 3

Experiment on the electrostatic repulsion of parallel electron beams. STEHBERGER, K. H. *Ann. Phys., Lpz.*, 41, 5, *pp.* 325–334, 1942.—[See Abstr. 872 (1938)]. The electric field of the more intense of the 2 beams causes the fine beam to spiral about an axis coincident with that of the stronger without producing any sensible change in the distance between the axes of the beams. The method of measurement is explained and the experimental arrangement described, with a schematic drawing of the experimental electron tube. The results conform to expectation.

H. G. S.

198 537.534.74

Note on the low-energy scattering of protons by protons. THAXTON, H. M. *Indian J. Phys.*, 16, *pp.* 133–137, *April*, 1942.—The scattering was investigated in the energy region 0·2 to 0·3 eMV [Abstr. 3012 (1939)]. This note derives the necessary theoretical calculations for the analysis of the experimental data.

199 537.565

Mobilities in some free-electron gases. BENNETT, W. H., AND THOMAS L. H. *Phys. Rev.*, 62, *pp.* 41–47, *July* 1 *and* 15, 1942.—Mobility coefficients for free electrons and mobilities of positive ions are reported for H, D and some mixtures of H and N, and of H and He, for field strengths between 1 and 2 V/cm. per mm. of Hg gas pressure. The relation between free-electron drift velocity and field strength is parabolic in this range for all these gases. These observations can be explained qualitatively if electrons excite rotations of the H molecules by collision, and the cross-sections for this process are estimated.

200 537.568

The loss of energy of hydrogen ions in traversing various gases. CRENSHAW, C. M. *Phys. Rev.*, 62, *pp.* 54–57, *July* 1 *and* 15, 1942.—The loss of energy of H and D ions having initial energies from 60 to 340 ekV has been measured as a function of their path in various gases at various pressures. The gases examined are air, water vapour, H, D and He.

201 537.591.08 = 3

An approved printometer. KOLHÖRSTER, W., AND LANGE, K. *Phys. Z.*, 42, 19–20, *pp.* 341–343, 1941.—The printometer is used for recording impulses of cosmic rays with tube counters in conjunction with a valve circuit for scaling down the counting rates. The impulses are added by a cyclometer counter with raised figures, and the readings are impressed on the record tape by hand or electromagnetically. The 3 main parts of the instrument are described in detail and illustrated. The printer electromagnet, the motor for the paper drive and the cyclometer counter motor, are arranged for direct circuit connection. A time switch is described for operating the printer electrically; it can be used to control several instruments simultaneously.

H. G. S.

202 537.591.15

Evidence for the existence of associated mesons in cosmic-ray showers. SINHA, M. S., AND SENGUPTA, R. L. *Indian J. Phys.*, 16, *pp.* 129–131, *April*, 1942.—A 2·2 cm. lead plate was placed inside the Wilson chamber and the nature of the particles photographed has been ascertained from the fact whether they have been absorbed or multiplied by this lead plate or have emerged out of it without producing secondaries.

See Abstr. 321 537.591.3 : 551.521.64(494) = 3

203 538.082 : 536.413 : 669.018

Simultaneous measurement of magnetic and dilatometric changes. ZMESKAL, O., AND COHEN, M. *Rev. Sci. Instrum.*, 13, *pp.* 346–348, *Aug.*, 1942.—Describes a combined magnet and dilatometer for simultaneously tracing the changes in alloys undergoing phase transformations. Measurements may be made while the specimen is being heated to, held at, or cooled from the reaction temperature. The apparatus has been applied particularly to the study of the

structural changes which occur during the tempering of hardened steel. Typical results for a plain carbon steel are included.

204 538.112

Magnetic ion. EHRENHAFT, F., AND BANET, L. *Science*, 96, *pp.* 228–229, *Sept.* 4, 1942.—Ehrenhaft's experiments, carried out on very small test bodies irradiated by light, show that, when in suspension in a homogeneous magnetic field, some of the particles of elements such as Fe, Ni, Sb, etc., move towards the north magnetrode, some towards the south, while others remain at rest. The moving particles reverse in direction instantly with reversal of the field and their velocities increase or decrease with the intensity of the illuminating beam. Such particles behave as magnetic ions. Experiments in an Ehrenhaft condenser are described which show that the magnetic ions, which are produced by light, are only a special case of a more general phenomenon. A. W.

See Abstr. 111 538.214 : 541.67 : 535.343

See Abstr. 164 538.22 : 548 : 537.226.2 : 536.631 = 3

205 538.221

The mechanism of magnetism. SIEGEL, S. *Westinghouse Engr*, 2, *pp.* 71–74, *Aug.*, 1942.—A short account of recent theories under the following heads: (1) Magnetic property of ferromagnetics, (2) magnetic structure of iron, (3) behaviour of iron in the magnetizing cycle, (4) coercive force determines losses, (5) significance of mechanical strain. E. R. A.

206 538.3

A generalized electrodynamics. I. Non-quantum. PODOLSKY, B. *Phys. Rev.*, 62, *pp.* 68–71, *July* 1 *and* 15, 1942.—The theory is based on the derivation of field equations and other field quantities from a Lagrangian involving the derivatives of the electric force. This leads to field equations of the sixth, as against the usual second, order. This is claimed to be an advantage as it permits of the imposition of finiteness conditions which remove the infinities found in the usual treatment of point charges. The relation of the theory to the Lande–Thomas treatment is discussed. G. C. McV.

See Abstr. 47 538.3 : 530.12

See Abstr. 76 538.56 : 532.59

207 538.652

Magnetostriction phenomena. WILLIAMS, W. D. *Gen. Elect. Rev.*, 45, *pp.* 161–164, *March*, 1942. *Abstr. in Bull. Hydro-elect. Pwr Comm. Ont.*, 29, *pp.* 159–162, *May*, 1942.—A general discussion of the phenomena and of various significant observations to date. E. R. A.

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208 539.13

Folding of the selenanthren molecule. WOOD, R. G., AND WILLIAMS, G. *Nature, Lond.*, 150, *pp.* 321–322, *Sept.* 12, 1942.

209 539.132 = 3

Classical theory of the scattering of charged mesons. FIERZ, M. *Helv. Phys. Acta*, 14, 4, *pp.* 257–270, 1941.—The vectorial meson theory is considered, the heavy particles at which scattering takes place being supposed to be at rest. The quantized meson theory is dealt with in the case where the quasi-electric coupling const., g_1, is not zero. The corresponding classical theory is developed, and the equations arrived at are applied to the case of scattering of a plane meson wave at a heavy particle. There is considerable agreement between the results arrived at by the quantum and classical theories, the difference lying only in the damping effect. A. J. M.

210 539.133

Interatomic distances in carbon. TAYLOR, A. *Nature, Lond.*, 150, *pp.* 462–463, *Oct.* 17, 1942.

211 539.133

The dipole moments of some bile acids. KUMLER, W. D., AND HALVERSTADT, I. F. *J. Amer. Chem. Soc.*, 64, *pp.* 1941–1943, *Aug.*, 1942.—The dipole moments of 10 bile acids were measured in dioxane. These bile acids are not associated in dioxane in conc. up to a wt. fraction of 0·017. The dipole-moment evidence points to the non-existence of choleic acids. The dipole moment of desoxycholic acid is normal with respect to the moment of other bile acids that do not form choleic acids.

See Abstr. 295 539,133 : 541.135.6

See Abstr. 314 539.133 : 541.57

212 539.133 : 541.571

The dipole moment of the C–H bond. COULSON, C. A. *Trans. Faraday Soc.*, 38, *pp.* 433–444, *Oct.*, 1942.—It is shown, on the basis of both electron-pair and molecular orbital approximations, that the d.m. of the C–H bond is of polarity C^+H^-, and its magnitude, in agreement with experiment, is about $0{\cdot}4 \times 10^{-18}$ e.s.u. The moment is practically independent of whether the C atom is aliphatic, aromatic, ethylenic or acetylenic, with a few uncommon exceptions. The explanation of the discrepancy between previous accounts of this bond and the present lies in the atomic-dipole term, which appears whenever the binding between 2 atoms is not pure, *s*, *p*, *d* . . . but a hybridized mixture of 2 or more pure types. A general formula for the d.m. of a bond which includes this term has been given, and this formula shows the relationship between d.m. and formal charge distribution. The ionic contribution to the C–H bond is larger than has generally been supposed.

213 539.133 : 541.67

The dissociation constant, dipole moment and structure of α-nitrotetronic acid. KUMLER, W. D. *J. Amer. Chem. Soc.*, 64, *pp.* 1948–1950, *Aug.*, 1942.—α-nitrotetronic acid has a *pKa* of 1·68 and a d.m. of 6·10. From considerations of general stability the enol form is more probable than the isonitro structure. Both the dissociation const. and the d.m. are consistent with the presence of a strong H bond in the enol form.

214 539.133 : 541.67

The dipole moment and structure of urea and thiourea. KUMLER, W. D., AND FOHLEN, G. M. *J. Amer. Chem. Soc.*, 64, *pp.* 1944–1948, *Aug.*, 1942.—The dipole-moment values indicate that urea and thiourea are resonance hybrids with a 20–30% contribution from the forms with a separation of charge. Urea and thiourea have nearly the same moments as the corresp. symmetrical di-substituted compounds. All

of these compounds have 2 equivalent forms with a separation of charge. The evidence of the existence of urea and thiourea as zwitterions is examined and it is shown that all the evidence can be adequately accounted for by the resonance hybrid structure whether urea is in the solid state or in dioxane, alcohol or water solutions.

215 539.152 = 3

Concept of the atom. I–II. SCHERRER, W. *Helv. Phys. Acta*, 15, 1, *pp.* 53–74, *and* 15, 5, *pp.* 476–496, 1942.—The concept of the atom is discussed on the basis of wave mechanics and the special theory of relativity. In Part I, definitions and postulates are considered, and equations for interaction of electrons are developed. The production of heavy particles is discussed. In Part II the subject is further developed, and the velocity spectrum of electrons is considered. A. J. M.

216 539.152.1

Anomalous scattering of mesons. HEITLER, W., AND PENG, H. W. *Phys. Rev.*, 62, *pp.* 81–82, *July* 1 *and* 15, 1942.

217 539.152.1

On the excited states of nuclei beyond oxygen. GUTHRIE, A., AND SACHS, R. G. *Phys. Rev.*, 62, *pp.* 8–10, *July* 1 *and* 15, 1942.—If spin-orbit coupling and the difference between neutron-neutron, neutron-proton and proton-proton forces, are neglected, the energies of the ground states of the nuclei beyond oxygen can be expressed in terms of the symmetry character of the wave functions and a smoothly varying function of atom. wt. With the same assumptions, the energies of the excited states of these nuclei can be expressed in similar terms. Thus the difference in energy of the ground states and the excited states of the same symmetry would be expected to vary smoothly as a function of mass number.

218 539.152.1 = 3

Meson theory of nuclear forces. FIERZ, M. *Helv. Phys. Acta*, 15, 4, *pp.* 329–330, 1942.—An extension of the equations of motion of a meson field, formerly put forward [see Abstr. 209 (1943)] is made. A. J. M.

See Abstr. 48 539.153 : 530.14

219 539.155

Density of sodium chloride. The atomic weight of fluorine by combination of crystal density and X-ray data. JOHNSTON, H. L., AND HUTCHISON, D. A. *Phys. Rev.*, 62, *pp.* 32–36, *July* 1 *and* 15, 1942.—The densities of carefully purified crystals of NaCl have been determined by the method of crystal flotation in pure ethylene dibromide. Six successive precipitations of NaCl are required to effect purification to const. density, and exposure to air produces surface contamination sufficient to cause erratic changes. With the adoption of 22·997 for the atom. wt. of Na, this yields 18·994 ± 0·001 for the atom. wt. of F. With the adoption of 22·994 for Na, the F atom. wt. comes out 18·992. The determination of rel. mol. wt. by combination of X-ray and density data are as reliable as by other std. methods.

220 539.155

New packing fractions and the packing-fraction curve. DUCKWORTH, H. E. *Phys. Rev.*, 62, *pp.* 19–28, *July* 1 *and* 15, 1942.—Descriptions and data are given of a number of mass comparisons. These, together with other recent data, are critically analysed, packing fractions are plotted against atomic number, and the rule is suggested that the packing fraction of an element with odd atomic number is algebraically larger than the average of the two adjacent elements with even atomic number. This implies that elements with even atomic number are more stable than odd-numbered elements and supports the theory that protons in the nucleus are associated in groups of 2.

221 539.155.2

A short history of isotopes and the measurement of their abundances. JORDAN, E. B., AND YOUNG, L. B. *J. Appl. Phys.*, 13, *pp.* 526–538, *Sept.*, 1942.

222 539.155.2 : 535.336.2

Measurement of relative abundance with the mass spectrometer. JORDAN, E. B., AND COGGESHALL, N. D. *J. Appl. Phys.*, 13, *pp.* 539–550, *Sept.*, 1942.—The paper covers the general methods employed in mass spectrometry, machine design, and possible sources of error in relative-abundance measurements which are inherently associated with instrument design.

See Abstr. 183 539.155.2 : 537.312.62 = 3

223 539.16.08

Operation of proportional counters. KORFF, S. A. *Rev. Mod. Phys.*, 14, *pp.* 1–11, *Jan.*, 1942.—The action of proportional counters is discussed from considerations of pulse size, the region of proportionality and the theory of the action. Methods of making measurements with, and of calibrating, these counters are described. The mechanism taking place in self-quenching counters is discussed. BF_3-filled neutron counters are described, and the technique of their construction and detecting circuits for use with them, are discussed. A. J. M.

224 539.16.08 = 3

An after-effect of the irradiation of counter tubes by X-rays. ROGGEN, F., AND SCHERRER, P. *Helv. Phys. Acta*, 15, 5, *pp.* 497–500, 1942.—Irradiation of a counter tube for about 20 min. by X-rays (160–180 kV, 6 mA) puts up the background by 2 to 10 times. The effect dies down exponentially with a half-value time of the order of hours, and is attributed to electronic emission from the metallic surfaces. It is most marked when these have been freshly turned. J. T.

225 539.164.9

Effect of strong electric fields on the radiochemical decomposition of gaseous ammonia. MCGUINNESS, M. J., JR., AND ESSEX, H. *J. Amer. Chem. Soc.*, 64, *pp.* 1908–1911, *Aug.*, 1942.—Ion yields in the α-ray decomposition of gaseous NH_3 at 25° and a pressure of 20 cm. have been determined over a wide range of field strengths. In the absence of a field none of the reaction is consequent on ion recombination under these experimental conditions. The increase in ion yield at high field strengths has been attributed to electron collisions. The electron collisions have been assumed to result in direct and resonance splitting of the NH_3 molecule. The splitting of an NH_3 molecule on collision with an electron does not involve electron attachment in the majority of such collisions.

226 539.166.2

The energy of gamma-rays accompanying the decay of Be^7. ZLOTOWSKI, I., AND WILLIAMS, J. H. *Phys. Rev.*, 62, *pp.* 29–32, *July* 1 *and* 15, 1942.—The γ-rays from the annihilation of N^{13} positrons were used for calibration of the absorbing system. The max. ranges in Al are, respectively, $0{\cdot}86 \pm 0{\cdot}04$ mm. for the annihilation radiation and $0{\cdot}77 \pm 0{\cdot}03$ mm. for that due to Be^7. The energy of the latter was $0{\cdot}485 \pm 0{\cdot}005$ eMV, by assuming γ-rays of 0·510 eMV from N^{13}.

227 539.166.8 = 3

Nuclear photo-effect with lithium γ-rays. HUBER, O., LIENHARD, O., SCHERRER, P., AND WÄFFLER, H. *Helv. Phys. Acta*, 15, 4, *pp.* 312–314, 1942.—γ-rays from Li, produced by bombardment of Li^7 with protons, excite the nuclear photo-effect in Mg^{24}, Al^{27}, S^{32}, K^{39}, Fe^{54}. The half-life periods and efficiencies are given. The elements or compounds used must be as pure as possible. A. J. M.

228 539.17

The characteristic radiations of Co^{60}. NELSON, M. E., POOL, M. L., AND KURBATOV, J. D. *Phys. Rev.*, 62, *pp.* 1–3, *July* 1 *and* 15, 1942.—The 10·7 min. period previously obtained from Co(n, γ) and Ni(n, p) reactions was produced by a Co(d, p) reaction. The increased activity from this latter reaction made energy measurements possible. The β-rays were measured with a maghetic spectrometer. The best interpretation of the data is that the β-rays are a continuous spectrum. The end point was evaluated at $1{\cdot}35 \pm 0{\cdot}1$ eMV. Absorption measurements indicated that each β-ray is accompanied by approx. 1 γ-ray of $1{\cdot}5 \pm 0{\cdot}2$ eMV energy. The 5·3-year period radiations previously studied were also investigated and found to consist of a $1{\cdot}7 \pm 0{\cdot}2$ eMV γ-ray and a 220 ± 20 ekV β-ray spectrum. These data suggest that Co^{60} may consist of isomeric nuclei in which the two activities decay independently.

229 539.172

Disintegration schemes of radioactive substances. IV. Fe^{59}. DEUTSCH, M., DOWNING, J. R., ELLIOTT, L. G., IRVINE, J. W., JR., AND ROBERTS, A. *Phys. Rev.*, 62, *pp* 3–7, *July* 1 *and* 15, 1942.—[See Abstr. 2629 (1942)]. The mode of disintegration of the 47-day isotope of Fe^{59} has been investigated by spectrometer and coincidence techniques. The β-ray spectrum is complex, consisting of 2 components of approx. equal intensity with end points $0{\cdot}257 \pm 0{\cdot}008$ eMV and $0{\cdot}460 \pm 0{\cdot}007$ eMV. The low-energy group is accompanied by γ-rays of energy $1{\cdot}30 \pm 0{\cdot}02$ eMV, and the high-energy group by γ-rays of energy $1{\cdot}10 \pm 10{\cdot}02$ eMV. Methods of purification and preparation are described.

230 539.181

The production of an atomic stream of known intensity. DITCHBURN, R. W. *Rev. Sci Instrum.*, 13, *pp.* 349–350, *Aug.*, 1942.

231 539.185

The elastic scattering of neutrons in deuterium. SUNDARACHAR, C. K., AND STREIB, J. F. *J. Mysore Univ.*, 3, 9, *pp.* 55–58, 1942.—The results of an experimental study are presented. If a potential interaction between the neutron and the deuteron is assumed, the results would indicate a fairly large value for the range of interaction.

232 539.185

The yield of neutrons from deuterons on carbon. BAILEY, C. L., PHILLIPS, M., AND WILLIAMS, J. H. *Phys. Rev.*, 62, *p.* 80, *July* 1 *and* 15, 1942.

233 539.185

On the inelastic scattering of neutrons by crystal lattices. SEEGER, R. J., AND TELLER, E. *Phys. Rev.*, 62, *pp.* 37–40, *July* 1 *and* 15, 1942.—Previous theoretical results are reviewed. Restrictive conditions imposed by interference are discussed. If the velocity of the incident neutrons is smaller than the sound velocity in the crystal, neutrons from a monochromatic, well-defined beam are scattered by inelastic processes into sharply limited areas. Inelastic scattering of faster neutrons should give rise to diffuse spots similar to those observed in inelastic scattering of X-rays.

See Abstr. 247 539.211 + 539.23] : 535.391

234 539.211

Preparation and use of diamond dust for cutting and polishing. STEIN, W. *Gemmologist*, 12, *pp.* 61–64, *Nov.*, 1942.—The extent to which operations performed with the aid of diamond-charged tools differ from other methods is theoretically considered. In cutting and drilling, the action of the grains is a chipping process, and the efficiency of the diamond is due to its ability to stand a high degree of compression without disintegrating and to retain a cutting edge longer than other abrasives. The uniformity in size of the abrasive particles plays a great rôle in the efficiency of the process. The action of polishing has been explained (1) as a very fine form of grinding, (2) as involving a degree of plastic flow on the surface being polished. H. H. HO.

235 539.211 : 539.26

X-ray measurement of the thickness of the cold-worked surface layer resulting from metallographic polishing. VACHER, H. C. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 177–181, *Aug.*, 1942.—Back-reflection patterns were made, and the thickness of the cold-worked surface layer was determined for steel (0·34% C), oxygen-free Cu and Al specimens, that were representative of specific abrasive treatments commonly used in metallographic polishing. A comparison of these patterns with others obtained from copper and steel specimens indicated that the cold-worked layers produced by certain fine-abrasive treatments were thicker than those produced by certain coarse-abrasive treatments. A. E. T.

236 539.214.9

The plastic-elastic behaviour of ebonite. SCOTT, J. R. *Trans. Faraday Soc.*, 38, *pp.* 284–292; *Disc.*, 292, *Aug.*, 1942.—[See Abstr. 1346 (1940)]. The difficulty of reconciling the 2-phase conception with the probable structure is avoided by replacing the elastic and viscous phases, respectively, by primary and secondary (cohesional) bonds, the relaxation of the latter, due to their relatively low temperature-stability, being responsible for all time effects in the deformation of ebonite.

237 539.214.9 : 541.24

Viscosity and cryoscopic data on polystyrene. Discussion of Staudinger's viscosity rule. KEMP, A. R., AND PETERS, H. *Industr. Engng Chem.*, 34, *pp.* 1097–1102, *Sept.*, 1942.—From cryoscopic and viscosity data, a K_{cm} value for polystyrene of $0{\cdot}45 \times 10^4$ is established for use in the viscosity/mol.-wt. equation:

$$M = \log \eta_r / C \times K_{cm}$$

This value is $< \frac{1}{3}$ that selected by Staudinger for polystyrene. Cryoscopic data at various conc. are presented on narrow fractions of polystyrene ranging in mol. wt. from 300 to 3 000. Solutions of polystyrene in benzene exhibit increasing deviation from Raoult's law as the mol. wt. increases beyond 1 000. The Staudinger viscosity/mol.-wt. rule cannot be applied to different polymers. A new K_{cm} equiv. for 1 chain atom is calculated for various polymers, based on the number of chain atoms in the base molecule, the K_{cm} value and the wt. proportion of chain atoms to the base mol. wt. A wide variety of linear polymers gives K_{cm} equiv. ranging from $2{\cdot}2 \times 10^4$ to $4{\cdot}8 \times 10^4$, depending on influences of solvent, side groups, etc.

238 539.215.4 : 531.724

Particle-size studies. Methods. SCHWEYER, H. E. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 622–632, *Aug.* 15, 1942.—The hydrometer, pipette and Wagner turbidimeter methods, for determining particle-size distribution in the sub-sieve size ranges were studied in detail. A special pipette for rapid analysis was designed. The Wagner turbidimeter gives good results only for ground sand, silica and certain cements.

239 539.215.4 : 531.724

Particle-size studies. SCHWEYER, H. E. *Industr. Engng Chem.*, 34, *pp.* 1060–1065, *Sept.*, 1942.—Particle-size distributions in the sub-sieve ranges have been used to study the development of surface and the decrease in top size in pebble mill operations using fluid media of different viscosities. E. R. A.

240 539.216.1 : 539.388.8 : 535.314 = 3

Swelling and light refraction, a lecture experiment with elastoidin fibres. SCHMIDT, W. J. *Kolloid Z.*, 99, *pp.* 254–258, *June*, 1942.—Elastoidin fibres obtained from the fins of shark are very suitable for showing to a larger audience the influence of swelling on light refraction. The Becke line at the boundary between swollen and non-swollen substance is strongly marked. By covering part of the fibre with Canada balsam, that part is prevented from swelling on application of water to the uncovered part of the fibre. The refractive index of the swollen fibre lies between that of the non-swollen part and that of water. R. N.

241 539.216.1 : 539.388.8 : 535.515 = 3

Deformation and orientation of isotropic nitrocellulose threads. I. General remarks, anisotropy of swelling and X-ray spectrograms. II. Double refraction in the non-swollen state. KRUYT, H. R., VERMAAS, D., AND HERMANS, P. H. *Kolloid Z.*, 99, *pp.* 244–253, *June*, 1942.—Elongation tests were made with isotropic threads of nitrocellulose at different degrees of swelling produced in pure alcohol and mixtures of alcohol and acetone. By measuring the anisotropy of swelling, and by X-ray diagrams, the orientation was determined. The results are compared with those previously obtained [Abstr. 1108 (1941)]. The net-like gel structure is not changed by nitration. A similar agreement was found concerning the double refraction [Abstr. 2539 (1940)]. Independently of the degree of swelling, double refraction is a linear function of the degree of elongation if the latter is referred to the dry state. R. N.

242 539.216.2

The preparation of silver chloride films. FUGASSI, P., AND MCKINNEY, D. S. *Rev. Sci. Instrum.*, 13, *pp.* 335–337, *Aug.*, 1942.—Transparent, plastic films can be obtained by rolling fused AgCl. Such films show high transmission for infra-red radiation and can be used for windows for infra-red absorption cells.

243 539.217

The influence of chemical structure on the imbibition of liquids by rubber. I. WHITBY, G. S., EVANS, A. B. A., AND PASTERNACK, D. S. *Trans. Faraday Soc.*, 38, *pp.* 269–275, *Aug.*, 1942.—The raw rubber samples were all taken from the same sheet of smoked sheet of sp. gr. 0·9146 at room temperature. The vulcanized samples were taken from sheets prepared by curing a 90 : 10 rubber : sulphur stock in a mould at 148°C. for 75 min. in an oil bath. The sp. gr. at room temperature was 0·9820. Weighted strips of dried rubber were placed in the various liquids in dried, corked test tubes. After intervals, the strips were removed and dropped into a weighted weighing bottle lined with filter paper. The stopper was at once inserted, the bottle was rolled round in order to remove liquid adhering to the rubber, the filter paper was quickly removed, the stopper inserted and the weight noted. The swollen strip was then returned to the liquid.

244 539.217

Absorption of liquids by coal. LAND, G. W. *Industr. Engng Chem.*, 34, *pp.* 1078–1082, *Sept.*, 1942.—Radiographic examination of coal before and after immersion in solutions of Pb salts has proved useful for estimating the order of absorption of liquids by the coal substance.

245 539.217 : 532.13 : 541.68

Permeability in relation to viscosity and structure of rubber. BARRER, R. M. *Trans. Faraday Soc.*, 38, *pp.* 322–330; *Disc.*, 330–331, *Aug.*, 1942.—Some properties of flow of solutes in and through rubbers are outlined. These properties indicate that, owing to fluctuations of thermal energy, activated zones exist in certain polymers, of which viscous flow and diffusion are a consequence.

246 539.217.5 : 533.15

Fluid flow through porous media. I. On the use of gases for the measurement of true permeability. SENGUPTA, N. C., AND NYUN, M. G. T. *Indian J. Phys.*, 16, *pp.* 119–128, *April*, 1942.—The rate of flow of H and O at various pressure gradients through 2 cores, one of high permeability the other of low permeability, was studied. The permeability calculated from the data for the core of lower permeability was const. up to 0·39 atm./cm. with H and 0·45 atm./cm. with O. With the other core the permeability decreased

with increase in pressure gradient. For both cores, permeabilities calculated using data from the rate of flow of O were < those obtained from calculations with H. This appeared to be due to slip effect, and the true permeabilities obtained after correction for slip were < the observed permeabilities obtained by direct measurement.

247 539.23 + 539.211] : 535.391

A method for investigating the thickness, chemical properties and surface structure of thin biological objects. WAUGH, D. F. *J. Opt. Soc. Amer.*, 32, *pp.* 495–502, *Sept.*, 1942.—The object is viewed with a microscope fitted with a vertical illuminator. Thickness is determined by matching the intensity of light reflected from the object with that reflected from a standard step film of barium stearate viewed in an identical companion system. The sensitivity is approx. ± 12 Å. The existence of patterns due to surface discontinuities may be detected and structure of this sort has been observed in the case of the limiting envelope of the mammalian red blood corpuscle.

248 539.26

Application of X-ray methods to the confirmation of the identity of organic compounds. SWAMY, S. R., AND SESHAIYENGAR, M. *Curr. Sci.*, 11, *p.* 276, *July*, 1942.

See Abstr. 235 539.26 : 539.211

249 539.26 : 621.386.7

X-ray analysis in industry. I–VI. ROOKSBY, H. P. *Elect. Times*, 102, *pp.* 116–119, *July* 23; 189–191, *Aug.* 6; 260–263, *Aug.* 20; 337–338 *and* 347–348, *Sept.* 3; 406–410, *Sept.* 17, *and pp.* 476–479, *Oct.* 1, 1942.—A survey of technique and applications.

250 539.26 : 621.386.7

Technique and applications of industrial microradiography. CLARK, G. L., AND GROSS, S. T. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 676–683, *Aug.* 15, 1942.—A survey of the development of a method first used by Goby in 1913, and its use for industrial purposes. This method involves the enlargement of radiographs taken with long-wavelength X-rays. In modern applications a Lipmann or other fine-grained emulsion is used and the resulting radiographs can be magnified up to 300 dia. without serious loss of definition. Thin sections are necessary and the characteristic radiation from a diffraction tube is more practicable for industrial purposes than the soft general radiation used by the early workers. Illustrations are given of the application of the method to metallography and biology.

J. T.

251 539.26 : 621.386.7

X-ray technique in the industrial laboratory. ROOKSBY, H. P. *J. Roy. Soc. Arts*, 90, *pp.* 673–706, *Oct.* 2, 1942.—The history is given of the discovery of X-rays and the development of their use for radiography and crystal analysis. The nature of X-rays is discussed and X-ray tubes, designed for special purposes, are described. Various questions of radiographic technique are considered and a full account given of the use of X-rays in crystal analysis. In this account the spectrometer method and the various photographic methods are described; and the powder method is dealt with in detail. The use of this method is illustrated for the identification of materials, the examination of solid solutions, the measurement of crystal size, the determination of lattice strain and the examination of preferentially oriented specimens.

J. T.

252 539.262 : 621.386.7 = 3

X-ray investigation of large lattice-plane distances and research on flowing solutions. KIESSIG, H. *Kolloid Z.*, 98, *pp.* 213–221, *Feb.*, 1941.—The X-ray camera used for investigating preparations with large lattice-plane distances is described in detail and illustrated. The camera is fitted with special devices for heating and cooling the test pieces and for investigating solutions flowing between 2 containers. Examples of application are discussed. R. N.

253 539.264 = 3

The spinning process with the technical spinning machine. I. The X-ray investigation of the spinning process and the determination of the stretching curves. KREBS, G. *Kolloid Z.*, 98, *pp.* 200–212, *Feb.*, 1942.

R. N.

254 539.264

The X-ray diffraction examination of material having the composition SiO. BAUMANN, H. N., JR. *Trans. Electrochem. Soc.*, 80, *pp.* 95–97; *Disc.*, 97–98, 1941.—Various substances produced in electric furnaces were examined by X-rays and shown to contain SiO_2, Si and SiC, but not SiO, which probably does not exist at ordinary temperatures.

ELASTICITY. STRENGTH

See Abstr. 168 539.31 : 536.7

255 539.319

Two problems of thermal stress in the infinite solid. MYKLESTAD, N. O. *J. Appl. Mech.*, 9, *pp.* A136–A143, *Sept.*, 1942.—Results are obtained for an infinite solid in which a small internal region, in the form of an ellipsoid of revolution, or a long narrow region, in the form of a semi-infinite circular cylinder, is hotter than the surrounding material.

256 539.374

A model illustrating intercrystalline boundaries and plastic flow in metals. BRAGG, W. L. *J. Sci. Instrum.*, 19, *pp.* 148–150, *Oct.*, 1942.—Describes a 2-dimensional model consisting of a raft of small bubbles formed on the surface of a soap solution by blowing air under const. head through a fine orifice beneath the surface. The very uniform bubbles so produced "crystallize" regularly.

E. R. A.

257 539.383 : 621.822 = 3

The penetration of a roll in a plane bearing. HERMANN, H. *Phys. Z.*, 42, 19–20, *pp.* 337–340, 1941.—Paraffin blocks are split by rolls of different diameter. Observations are made of the manner in which the fissures are formed, and the force necessary is determined per cm. length and radius of the roll. With decreasing roll radius the force increases slowly from the limiting resistance to compression. The theory of the pressure exerted by a roll in contact with a plane bearing is derived as a special case of crossed cylinders of unequal radii. H. G. S.

258 539.388.8

Variation in shrinking and swelling of wood. STAMM, A. J., AND LOUGHBOROUGH, W. K. *Trans. Amer.*

Soc. Mech. Engrs, 64, *pp.* 379–385, *May*, 1942.—The paper points out that, while the forces that cause wood to shrink and swell are chemical in nature, the factors which influence the degree of external dimension change are largely physical or mechanical. Orientation of the structural units, sp. gr. or porosity of the wood and the stresses set up by moisture gradients, determine the change in external dimensions as the wood loses or gains moisture. Water-soluble extractives, because of their bulking effect, reduce shrinkage.

See Abstr. 240 539.388.8 : 539.216.1 : 535.314 = 3

See Abstr. 241 539.388.8 : 539.216.1 : 535.515 = 3

See Abstr. 307 539.388.8 : 541.182.5 : 532.71

259 539.389.3

Effect of machining and ageing on the damping capacity of steel. TARNOPOL, L., AND MORGAN, J. R. *J. Appl. Phys.*, 13, *pp.* 343–344, *May*, 1942.—The known effect that two bars of steel from the same consignment exhibit widely different damping capacities at high values of strain was tested in 7 cylinders of cold-rolled steel. The effect was verified for stresses of 24 000 lb./in.^{2} The effect wears off with ageing at room temperature for several weeks, and with annealing at 400°F. for 4 hr. The effect is mainly due to the condition of the outer fibres in which machining leaves stresses. An explanation is given on the lines of plastic flow of atoms into neighbouring voids. G. E. A.

260 539.4.015.1 : 541.68

The kinetics of rubber-like elasticity. ELEY, D. D. *Trans. Faraday Soc.*, 38, *pp.* 299–305; *Disc.*, 306–309, *Aug.*, 1942.—The treatments of relaxation phenomena in polymer systems are outlined and discussed. Eyring's rate equation is used to analyse the rates of orientation of long-chain molecules in a stressed specimen of lightly vulcanized rubber. The data are compared with similar data on the viscous flow in raw rubber. In viscous flow, the segmental movement occurs without appreciable internal rotation within the segment. In elastic orientation a high degree of internal rotation within the segment accompanies the formation of the activated state. The activation energy for the orientation of long chains is separated into two terms: (i) the energy required to free a segment from its neighbours, (ii) the energy of activation for rotation around C–C bonds. The main effect of vulcanization and plasticisers is on term (i); vulcanization tends to increase this term, and plasticisers to decrease it. Data on the dielectric dispersion of polyvinyl chloride suggests the need for internal rotational activation in this case, as in orientation elasticity.

261 539.4.015.1 : 541.68

The kinetics of high elasticity in synthetic polymers. TUCKETT, R. F. *Trans. Faraday Soc.*, 38, *pp.* 310–317; *Disc.*, 317–322, *Aug.*, 1942.—The simple Mark–Kuhn theory of high elasticity of rubber has been extended, on the basis of the work of Alexandrov and Lazurkin, to cover the elastic properties of other polymers. The chief principle invoked is that high elasticity is only developed when rotation of the main C–C chain in the polymer is comparatively free. The effect of mol. structure, plasticizer and cross-links on elastic properties has been indicated, and also a connection with other physical properties such as volume expansion, dielectric dispersion and sp. ht.

262 539.4.015.1 = 3

Relationship between structure and strength characteristics of compressed phenoplastics. SIEGFRIED, W. *Schweiz. Arch. angew. Wiss. Techn.*, 8, *pp.* 255–262; *Aug.*, 1942.—A description is given of the processes of failure of metals, so far as they are known at present, i.e. the various processes of slip in the crystal structure are mentioned. The processes are then considered as far as possible from the viewpoint of the plastic materials. In a metal, applied stress causes a large deformation before fracture occurs, while volumetric stressing causes only small deformation—a phenoplastic without filler gives only small deformations in both cases. In the metal the volumetric strength is greater than the structural strength, the reverse is the case with the unfilled phenoplastic. The type of filler employed has a considerable effect on the tensile strength, e.g. sawdust gives a fracture surface perpendicular to the direction of the applied stress, asbestos causes it to slope, while textile fibres produced the most inclined form of fracture surface.

A. C. W.

263 539.4.019 : 669.3

The use of fired small-arms cartridge cases in the production of some alpha-beta extrusion brasses: indications of the effects on the physical properties of the extruded rods. RAE, J. *J. Inst. Met.*, 68, *pp.* 311–328, *Oct.*, 1942.—An investigation of the effect of the use of fired cartridge cases on the properties of straight brasses containing 62, 59 and 56% Cu, on 3 std. leaded brasses, and on 1 naval brass. The use of fired cartridge cases impairs the impact resistance and bending and cold-riveting properties; the extent of the effect depends on the percentage of cartridge cases used, and is greatest in the straight brass of 62% Cu content. The deleterious element is Sb. Observations have been made on the microstructures, machinability and susceptibility to season-cracking of the alloys.

See Abstr. 178 539.41 : 532.133 : 537.226.2 = 3

264 539.433

Some dynamic properties of rubber. HARRIS, C. O. *J. Appl. Mech.*, 9, *A*129–*A*135, *Sept.*, 1942.—The internal damping and the dynamic modulus of elasticity were measured for rubber cylinders bonded to steel cylinders at the ends and stressed in compression, and specimens of rubber bonded to steel and stressed in shear.

265 539.501

A rheological chart. BILMES, L. *Nature, Lond.*, 150, *pp.* 432–433, *Oct.* 10, 1942.

266 539.531 : 621.78

The effect of quenching and of subsequent prolonged tempering at 100° or 140°C. on α-base antimony-cadmium-tin alloys. I. Changes in hardness. PELL-WALPOLE, W. T. *J. Inst. Met.*, 68, *pp.* 329–345, *Oct.*, 1942.—The results are compared with the hardness values of the alloys in a state of stable equilibrium. Alloys containing Sb 4–7%, Cd 0–2% undergo

no changes. Alloys containing Sb 7–14%, Cd 0–2% undergo appreciable temper-hardening. The remaining alloys all harden on quenching, but re-soften on prolonged tempering. Some of the temper-hardening alloys maintain a useful degree of improvement for at least 1 000 hr. at 100° or 140°C.

267 539.62

Mechanism of metallic friction. HURST, J. E. *Nature, Lond.*, 150, *p.* 349, *Sept.* 19, 1942.

PHYSICAL CHEMISTRY

268 541.115 : 518.3

The system nitric-acid–sulphuric-acid–water. MCCURDY, J. L., AND MCKINLEY, C. *Industr. Engng Chem.*, 34, *pp.* 1002–1004, *Aug.*, 1942.—Describes an enthalpy-temperature nomogram.

269 541.121

Solvent effects in association equilibria. WASSERMANN, A. *J. Chem. Soc.*, *pp.* 621–623, *Oct.*, 1942.—Deals with the thermal equilibrium between the free radical β-benzoyl-$\alpha\alpha$-diphenylhydrazyl and its dimeride dibenzoyltetraphenyltetrazan.

270 541.123.2

Methane-isobutane system. OLDS, R. H., SAGE, B. H., AND LACEY, W. N. *Industr. Engng Chem.*, 34, *pp.* 1008–1013, *Aug.*, 1942.—The study of the volumetric and phase behaviour of the methane-isobutane system was undertaken at pressures up to 5 000 lb./in.^{2} betw. 100° and 460°F.

271 541.123.2.034.6 = 3

Do all binary systems approximate Raoult's law with increasing dilution? FREDENHAGEN, H., AND TRAMITZ, E. *Kolloid Z.*, 99, *pp.* 283–290, *June*, 1942.—Although there exist quite a number of mixing conditions which at high dilution lead to an asymptotic approximation of the curves of rel. partial pressure to the straight line corresponding to Raoult's law, neither theoretical considerations nor exp. results justify the conclusion that such an approximation is necessary for all binary systems. [See Abstr. 2498 (1941)]. This is discussed for gaseous and liquid systems. R. N.

272 541.123.21

Vapour/liquid equilibrium data on ethyl-alcohol–water and on isopropyl-alcohol–water. LANGDON, W. M., AND KEYES, D. B. *Industr. Engng Chem.*, 34, *pp.* 938–942, *Aug.*, 1942.—The equilibrium relation for the system isopropyl-alcohol–water has been determined within a reproducible accuracy of 0·2 mole %. The const.-boiling mixture of isopropyl-alcohol–water was determined to be 68·35 ± 0·03 mole % alcohol.

273 541.123.23

Phase equilibria in hydrocarbon systems. SAGE, B. H., REAMER, H. H., OLDS, R. H., AND LACEY, W. N. *Industr. Engng Chem.*, 34, *pp.* 1108–1117, *Sept.*, 1942.—The sp. vol. of 6 mixtures of methane and *n*-pentane were determined for 7 diff. temperatures betw. 100° and 460°F., up to 5 000 lb./in.^{2} The composition of the dew-point gas was experimentally established throughout the 2-phase region above 160°F. The sp. vol., bubble-point pressure, and dew-point pressure for each of the mixtures, as well as the sp. vol. and compositions of the co-existing phases for a number of temperatures, are recorded. The fugacity of each of the components in the co-existing phases is included.

274 541.123.28

Correlating gas solubilities and partial-pressure data. OTHMER, D. F., AND WHITE, R. E. *Industr. Engng Chem.*, 34, *pp.* 952–959, *Aug.*, 1942.—A new method of representing gas solubility data has been developed and applied to a number of gas-liquid systems. Data for systems obeying Henry's law closely and for systems that deviate widely from it are plotted. From the basic equation the variation of the Henry const. with temperature may be developed and represented graphically.

275 541.124

The kinetics of the thermal reaction between hydrogen and cyanogen. ROBERTSON, N. C., AND PEASE, R. N. *J. Amer. Chem. Soc.*, 64, *pp.* 1880–1886, *Aug.*, 1942.—The thermal reaction of H and CN to yield HCN was studied over the range 550°–675°. The reaction proceeds without undue complications, but the nature of the surface of the reaction bulb has some influence on the rate. The product inhibits the reaction. Packing increases the rate at low temperatures but has little effect above 625°. Evidence is presented which favours a radical chain mechanism involving gas-phase propagation by H atoms and cyanide radicals with chains starting and breaking on the walls. The steps in this process would be analogous to those in the H–Br reaction.

276 541.124

Rate and mechanism in the reactions of *t*-butyl nitrate and of benzyl nitrate with water and with hydroxyl ion. LUCAS, G. R., AND HAMMETT, L. P. *J. Amer. Chem. Soc.*, 64, *pp.* 1928–1937, *Aug.*, 1942.—The reaction of *t*-butyl nitrate produces alcohol and olefin in proportions similar to those in which they are formed from *t*-butyl halides. Since, further, the energies of activation of nitrate and halide reactions are nearly identical, an identity of mechanism is strongly indicated. No appreciable reaction with hydroxyl ion or catalysis by acids has been observed.

277 541.124

Kinetics of the alkaline hydrolysis of propionitrile. RABINOVITCH, B. S., AND WINKLER, C. A. *Canad. J. Res. A*, 20, *pp.* 185–188, *Sept.*, 1942.—Some contradictory points recorded for the alkaline hydrolysis of nitriles have been clarified by a study of propionitrile hydrolysis in aq. NaOH solutions of conc. 0·3 to 4 *N*. The rate of alkaline hydrolysis of propionitrile is given by the rate of formation of total NH_3 and intermediate amide and not by that of NH_3 alone. An activation energy of 20 300 cal. was determined for the reaction in 0·65 *N* alkali.

278 541.124 = 3

The species of reaction of the type $A_{solid} + B_{solid} \rightarrow AB_{solid}$. IV Comprehensive communication on the course of chemical processes in which solid substances are concerned. HÜTTIG, G. F. *Kolloid Z.*, 99, *pp.* 262–277, *June*, 1942.—[See Abstr. 2419 (1942)]. A list is given of the substances—especially oxides—so far investigated, together with a bibliography. The characteristic temperatures of pure substances are tabulated; 3 characteristic shapes and relative trends of the curves are discussed, showing the dependence

of reaction heat and affinity on temperature. These curves are calculated for the reaction $CaO + SiO_2 \rightarrow CaSiO_3$. Affinity with respect to the formation of chemical compounds decreases with increasing temperature, affinity with respect to the formation of solutions increases with increasing temperature.

R. N.

279 541.124.7

α-methylenic reactivity in olefinic and polyolefinic systems. FARMER, E. H. *Trans. Faraday Soc.*, 38, *pp.* 340–348, *Aug.*, 1942.

280 541.124.7

The course and mechanism of autoxidation reactions in olefinic and polyolefinic substances, including rubber. FARMER, E. H., BLOOMFIELD, G. F., SUNDRALINGAM, A., AND SUTTON, D. A. *Trans. Faraday Soc.*, 38, *pp.* 348–356, *Aug.*, 1942.

281 541.124.7

Ionic and radical mechanisms in olefinic systems, with special reference to processes of double-bond displacement, vulcanization and photo-gelling. FARMER, E. H. *Trans. Faraday Soc.*, 38, *pp.* 356–361, *Aug.*, 1942.

282 541.127

The effect of inhibitors on the rate of oxidation of copper by oxygen in phosphoric acid solutions. LAWRENCE, R. W., AND WALTON, J. H. *J. Phys. Chem.*, 46, *pp.* 609–616, *June*, 1942.—The rate of corrosion of Cu powder by O was studied in dilute H_3PO_4 solution and the effect of nitrogenous inhibitors investigated. It was found that the reaction rate is $\propto$ the O conc. and to the cupric-ion conc. The exp. results indicate that the amine cations are adsorbed on the cathodic areas of the Cu and thereby decrease the rate of oxidation.

283 541.127

Some aspects of the rate of reaction of oleic acid with oxygen. HENDERSON, J. L., AND YOUNG, H. A. *J. Phys. Chem.*, 46, *pp.* 670–684, *June*, 1942.—The induction periods and rates of oxygen absorption of a number of preparations were found to be similar at 80°C., and the induction periods were approx. 5 hr. The empirical rate law, $-dO_2/dt = k_1 + k_2$ (peroxide)$(O_2)^{\frac{1}{2}}$ was found to hold for the early stages in the autoxidation of oleic acid. The data indicated that peroxide formation was the initial reaction.

H. H. HO.

284 541.127

The kinetics of the reaction between copper and iodine in aqueous (potassium iodide) solution. I. BIRCUMSHAW, L. L., AND EVERDELL, M. H. *J. Chem. Soc.*, *pp.* 598–605, *Oct.*, 1942.

285 541.128

Homogeneous catalysis of diene syntheses. A new type of third-order reaction. WASSERMANN, A. *J. Chem. Soc.*, *pp.* 618–621, *Oct.*, 1942.

286 541.128

Homogeneous catalysis and solvent effects in a diene synthesis. WASSERMANN, A. *J. Chem. Soc.*, *pp.* 623–626, *Oct.*, 1942.

See Abstr. 315 541.128 : 541.64

See Abstr. 174 541.13 : 537.221

287 541.132

Theory of the iso-electric point. III. HILL, T. L. *J. Phys. Chem.*, 46, *pp.* 621–624, *June*, 1942.—By re-defining the iso-electric condition, solubility and ionization, in terms of activities, and employing thermodynamic equilibrium const., essentially the same results are obtained as previously [Abstr. 2917 (1942)], but differing in that (1) the present treatment is thermodynamically exact but (2) it is of only theoretical interest at present.

288 541.132 : 535.375.5

Study of electrolytic dissociation in iodic acid by Raman effect. RAO, N. R. *Indian J. Phys.*, 16, *pp.* 71–76, *April*, 1942.—[See Abstr. 3197 (1940)]. Iodic acid contains polymerized molecules of the type $(HIO_3)_2$ in conc. solutions. As the acid is diluted, the polymers are found to dissociate into HIO_3 molecules which again dissociate into IO_3 ions at still lower conc. On comparing 0·1 *N* solutions of KIO_3 and HIO_3, it is found that the intensity of the IO_3 line in KIO_3 solution is much greater than in HIO_3 solution. The acid is not completely dissociated.

See Abstr. 169, 170 541.132 : 536.7

See Abstr. 312 541.132 : 541.452

See Abstr. 318, 319 541.132 : 541.8

289 541.133

Conductances of solutions of several alkyl sulphates and sulphosuccinates. HAFFNER, F. D., PICCIONE, G. A., AND ROSENBLUM, C. *J. Phys. Chem.*, 46, *pp.* 662–670, *June*, 1942.—The course of the conductivity curves indicates that aggregation occurs with sulphosuccinates as with the alkyl sulphates. From these data, critical conc. for micelle formation and equiv. conductances at inf. dilution were estimated.

See Abstr. 175 541.134 : 537.221

290 541.134.4

A theory of electrical polarity in cells. II. WILLIAMSON, R. R. *Bull. Math. Biophys.*, 4, *pp.* 101–105, *Sept.*, 1942.—[See Abstr. 2703 (1942)]. Orders of magnitude and relations of the constants in the equations of the polar cell are discussed. Some considerations on the mechanism of polarity are presented and a more general mechanism discussed. It is shown that polarity can exist without catalysis, either stimulating or inhibiting.

291 541.135.27 = 3

On electrolysis of fatty acids containing deuterium. III. On the mechanism of the formation of propylene and propane at the electrolysis of butyric acids. SCHANZER, W., AND CLUSIUS, K. *Z. phys. Chem. A*, 190, *pp.* 241–253, *Feb.*, 1942.—The electrolysis of butyric acids containing D gives rise to an exchange of the carbon-bound Hα atoms with the water of solution. Propylene formation at the anode is caused by dehydration of the β-carbon. The gas-density balance used for the determination of the mol. wt. and for the analysis of isotopes is described and illustrated [see Abstr. 1302 (1933)].

R. N.

292 541.135.5

A dropping-mercury electrode. KAHAN, G. J. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *p.* 549, *July* 15, 1942.—The rubber connections are eliminated by a simple siphon system.

293 541.135.5

Simplified dropping-mercury electrode for polarographic analysis. McREYNOLDS, R. C. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 586–587, *July* 15, 1942.

294 541.135.5 : 541.182.63

The electrochemical properties of mineral membranes. V. Beidellite membranes and the determination of sodium. MARSHALL, C. E., AND KRINBILL, C. A. *J. Amer. Chem. Soc.*, 64, *pp.* 1814–1819, *Aug.*, 1942.—[See Abstr. 1918 (1942). Clay membranes were prepared which are sensitive only to monovalent cations (H-montmorillonite 490°); to monovalent and divalent cations (H-montmorillonite 350°); and to mono-, di- and trivalent cations (H-beidellite 600°). For Na estimations, beidellite membranes gave excellent reproducibility. The potentials obtained with solutions less conc. than 0·03 *N* were within 1 mV of those calculated using the Nernst equation. NaCl, Na_2SO_4 and $Fe(CN)_2$ gave practically the theoretical potentials whereas low values were obtained with Na citrate.

295 541.135.6 : 539.133

The electric polarization of mercurous trichloroacetate and of quinol bistrichloroacetate. DAVIDSON, N. R., AND SUTTON, L. E. *J. Chem. Soc.*, *pp.* 565–567, *Sept.*, 1942.—Mercurous trichloroacetate is soluble in benzene. In order to discover whether this is due to any peculiarity in the structure of the solute molecule, its electric polarization in this solvent has been determined at 25° and compared with that of quinol bistrichloroacetate, with which there might be a structural similarity if the O–Hg–Hg–O atoms are collinear in the former. The apparent electric dipole moments are $2{\cdot}65 \pm 0{\cdot}10$ and $1{\cdot}50 \pm 0{\cdot}20$ D., respectively, the uncertainties being due to atom polarization.

296 541.138.3

The reduction of unsaturated hydrocarbons at the dropping-mercury electrode. I. Phenyl-substituted olefins and acetylenes. LAITINEN, H. A., AND WAWZONEK, S. *J. Amer. Chem. Soc.*, 64, *pp.* 1765–1768, *Aug.*, 1942.—The polarographic reduction of a series of phenyl-substituted olefins and acetylenes is studied. The most suitable solvent medium is a dioxane–water mixture containing 75% dioxane, with tetrabutylammonium iodide as a supporting electrolyte. Each compound gives a single reduction wave in neutral or alkaline medium with a $\frac{1}{2}$-wave potential which is independent of the *p*H. The diffusion current is $\propto$ the hydrocarbon conc.

297 541.138.3

The reduction of iodate and bromate at the dropping-mercury electrode in neutral and basic media and the effects of salts upon the current/voltage curves. ORLEMANN, E. F., AND KOLTHOFF, I. M. *J. Amer. Chem. Soc.*, 64, *pp.* 1970–1977, *Aug.*, 1942. The following relation exists betw. the potential and $(i_d - i)/i$ and the conc. of the indifferent cation M:

$$\pi = \pi^{1/2} + a \log(i_d - i)/i + b \log M.$$

There is a linear relation between the shift of the $\frac{1}{2}$-wave potential and the conc. of the different cation in the solution.

298 541.141 : 77.012

Uniform representation of the characteristic curves of pure silver bromide emulsions, unsensitized and sensitized. SILBERSTEIN, L. *J. Opt. Soc. Amer.*, 32, *pp.* 474–485, *Aug.*, 1942.—A comparatively simple sensitometric formula is presented, derived by an asymptotic process from the quantum theory of exposure. The formula has undergone extensive tests, and it is found to represent very closely a great number of characteristic curves observed in various emulsions under different development conditions.

A. H.

299 541.141.9

The photosensitive complexes in the photolysis of uranyl oxalate and their dissociation constants. HEIDT, L. J. *J. Phys. Chem.*, 46, *pp.* 624–630, *June*, 1942.—Calculations based on quantum yield, absorption spectra and *p*H measurements, indicate that the photosensitive clusters in solutions of uranyl sulphate (or oxalate) and oxalic acid (or alkali oxalate) are $UO_2H_2C_2O_4^{++}$, $UO_2C_2O_4$ and $UO_2(C_2O_4)_2^{--}$, the ionization const. of which at 25°C. are, respectively, 0·0027, 0·0000015 and 0·000018 (first) at zero ionic strength. Gross quantum yields and absorption data at 208 mμ are consistent with these calculations.

300 541.141.9

The photolysis of dimethylhydrazine. KAY, W. L., AND TAYLOR, H. A. *J. Chem. Phys.*, 10, *pp.* 497–504, *Aug.*, 1942.—The ultra-violet absorption spectrum of dimethylhydrazine exhibits a continuum from 2 800 Å to beyond 2 000 Å. Despite the absence of structure the continuum is probably experimental and indicates predissociation. The photolysis using various light sources, at several pressures and wavelengths, was studied. The over-all quantum yield is 0·3. The principal initial rupture of the molecule involves the scission of a H atom. Analytically 3 molecules of the hydrazine give 1 molecule each of H_2, N_2, CH_4, NH_3, CH_3NH_2 and $(CN_3N : CH_2)_2$.

301 541.144.8

The vapour phase photo-decomposition of methyl formate. VOLMAN, D. H. *J. Amer. Chem. Soc.*, 64, *pp.* 1820–1821, *Aug.*, 1942.—The presence of methanol in the photolysis products of methyl formate is shown. The decomposition quantum yield for the photolysis is approx. 0·75 for an ester pressure of 75·0 mm. at 25°. [See Abstr. 581 (1942)].

302 541.144.8

Effect of light on riboflavin solutions. O'MALLEY, C. M., AND SIEVERT, C. W. *Industr. Engng Chem.*, 34, *pp.* 1117–1118, *Sept.*, 1942.—Destruction by sunlight of riboflavin in 2 extracts of naturally occurring riboflavin and in /1 solution of the synthetic product were decreased from almost complete destruction to a comparatively small loss, by maintaining the riboflavin in the reduced state with $Na_2S_2O_4$ during exposure to sunlight and reoxidation by air after exposure.

303 541.18.043

Fractionation of colloidal systems. FANCHER, G., OLIPHANT, S. C., AND HOUSSIERE, C. R., JR. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 552–554, *July* 15, 1942.—Discusses the selection of operating conditions for the supercentrifuge.

304 541.18.047 : 541.183.2

Delayed adsorption and diffusion in colloidal media. BRANSON, H. *Bull. Math. Biophys.*, 4, *pp.* 131–137, *Sept.*, 1942.—The behaviour of the diffusion coeff. of a solute which can be adsorbed by a colloid only after the colloid has aggregated to a certain size is deduced on the basis of a few assumptions. Some relations of such a mechanism to cell reactions are indicated.

305 541.182 : 536.7 = 3

The disperse structure of solid systems and its thermodynamic foundation. BALAREW, D. *Kolloid Z.*, 99, *pp.* 291–293, *June*, 1942.—As a further proof of the thermodynamic foundation of the disperse structure of solid crystal systems, the temperature of the beginning of grey glow was determined for variously treated Au and Ag plates. It was further proved that the changes in the system start at its surface. [See Abstr. 1657 (1942)]. R. N.

See Abstr. 66 541.182 : 677.46 : 532.133 = 3

See Abstr. 132 541.182.4 : 535.434

306 541.182.5

Rubber photogels. NAUNTON, W. J. S. *Trans. Faraday Soc.*, 38, *pp.* 332–339; *Disc.*, 339–340, *Aug.*, 1942.—The conditions of photogel formation and reversion in rubber solutions have been studied. The larger the rubber molecule the more readily is gel formation effected. Photogels exhibit all the properties associated with cross-linked molecules. Photogels made with most synthetic rubbers are not influenced to the same extent by the presence of oxygen and do not revert on further exposure in the presence of oxygen.

307 541.182.5 : 532.71 : 539.388.8

Wood–water relationships. VIII. Some elastic constants and swelling pressures of natural wood and of its gel material. BARKAS, W. W. *Trans. Faraday Soc.*, 38, *pp.* 447–462, *Oct.*, 1942.—From methods developed previously [Abstr. 1656 (1942)], equations are derived for the swelling pressures exerted under a variety of conditions by natural wood and by the gel material of which it is composed. The sources of internal restraint which bring shear stresses into play during swelling are examined and discussed. Other equations give the bulk modulus of the natural wood and the bulk modulus and transverse rigidity modulus of the gel material. It is assumed that the unit cell in wood approximates to a long hollow cylinder, isotropic in the transverse plane, whose longitudinal swelling is small compared with the transverse.

See Abstr. 294 541.182.63 : 541.135.5

See Abstr. 304 541.183.2 : 541.18.047

308 541.183.26 : 536.658

Surface available to nitrogen on bone black and other carbonaceous adsorbents. DEITZ, V. R., AND GLEYSTEEN, L. F. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 191–225, *Sept.*, 1942.—The adsorption of N was determined at both liquid-nitrogen and oxygen temperatures by measuring the pressure decrease of a known vol. of the gas exposed to each of 20 different samples of bone blacks, activated carbons, vegetable carbons, and coconut charcoals. Typical adsorption isotherms are illustrated and sp. surfaces were estimated from an analysis of the data with the aid of the multimolecular theory of adsorption. The differential heats of adsorption were also determined from the data, and the dependence of the adsorption on capillarity was studied. A. E. T.

309 541.183.56

On the adsorption of water vapours by cellulose. BABBITT, J. D. *Canad. J. Res. A*, 20, *pp.* 143–172, *Sept.*, 1942.—In this paper an attempt is made to gather together the best available data on the adsorption of water vapours by cellulose and to draw from this data a unified picture of the phenomenon. E. R. A.

310 541.183.56

Adsorption potentials at gas-solid interfaces. FROST, A. A. *Trans. Electrochemical Soc.*, 82, *Prepr. No.* 10, *Oct.*, 1942.—An improved apparatus for the study of potentials due to adsorption of vapours at solid surfaces is described. Typical results are presented and discussed. A possible application of the experimental technique to the detection of odours is suggested. E. R. A.

See Abstr. 237 541.24 : 539.214.9

311 541.25

The apparent molal volumes of aqueous solutions of sulphuric acid at 25°. KLOTZ, I. M., AND ECKERT, C. F. *J. Amer. Chem. Soc.*, 64, *pp.* 1878–1880, *Aug.*, 1942.—The densities of solutions of H_2SO_4 were determined over the conc. range of 0 to 3 molar and the apparent molal vol. interpreted in terms of the volumes of the H sulphate and bisulphate ions.

312 541.452 : 541.132

An extension of the acidity scale. MICHAELIS, L., AND GRANICK, S. *J. Amer. Chem. Soc.*, 64, *pp.* 1861–1865, *Aug.*, 1942.—An extension of the *p*H scale for aq. solutions of H_2SO_4 up to 11 molar is accomplished by utilizing the spread of the normal potentials of certain dyestuffs which form large amounts of semiquinone radicals at suitable acidities.

313 541.5

Modern conception of valency. RAY, P. *Sci. and Cult.*, 7, *pp.* 583–588, *June*, 1942.—The nature and characteristics of attractive forces, classified as electrostatic or ionic, atomic or covalent, and metallic, are explained, and the corresponding valencies or bonds are discussed and illustrated with reference to simple representative substances. N. M. B.

See Abstr. 128 541.57 : 535.375.5

314 541.57 : 539.133

The determination of the angle between the phenyl groups in αα-diphenylethylene, from electric dipole-moment measurements. COATES, G. E., AND SUTTON, L. E. *J. Chem. Soc.*, *pp.* 567–570, *Sept.*, 1942.—From the electric dipole moments obtained for αα-diphenylethylene and several *p*-substituted derivatives thereof, the valency angle between the attached phenyl groups has been calculated. The value obtained is 125° ± 3°. This large value can hardly be explained except by resonance involving the 2 benzene rings and the ethylenic double bond, which would make the rings tend to be coplanar and so, by creating steric repulsion, cause the angle between them to be greater than that found in diphenylmethane (115° ± 5°) or for the CH_2 angle in ethylene (118°). The valency angle

observed is not large enough to allow of the rings being coplanar, and in order to give the distance of 2·4 Å, the min. permissible between unbonded H atoms, it is necessary that the rings be twisted about 30° out of the common plane.

See Abstr. 212 541.571 : 539.133

See Abstr. 119 541.6 : 535.371

See Abstr. 112 541.621 : 535.37 : 535.343.2

315 541.64 : 541.128

Catalysed polymerization of methyl methacrylate in the liquid phase. NORRISH, R. G. W., AND SMITH, R. R. *Nature, Lond.*, 150, *pp.* 336–337, *Sept.* 19, 1942.

See Abstr. 179 541.67 : 532.133 : 537.226.2

See Abstr. 111 541.67 : 538.214 : 535.343

See Abstr. 213, 214 541.67 : 539.133

316 541.68

Viscosity and chemical constitution. FRIEND, J. N. *Nature, Lond.*, 150, *p.* 432, *Oct.* 10, 1942.

See Abstr. 245 541.68 : 532.13 : 539.217

See Abstr. 260, 261 541.68 : 539.4.015.1

317 541.8 : 532.13

Solvent properties of isomeric paraffins. MCARDLE, E. H., AND ROBERTSON, A. E. *Industr. Engng Chem.*, 34, *pp.* 1005–1008, *Aug.*, 1942.—Comparative solvent properties, as measured by dilution ratios and viscosities of polymer solutions, have been determined on 2 pairs of isomeric paraffins. Two series of polymers —low-mol.-wt. polybutenes and alkyd resins—were used at conc. of 800 g./l. with viscosities ranging from 0·1 to 150 poises. The highly branched paraffins produce polymer solutions whose rel. viscosities average more than twice those of corresp. solutions in straight-chain solvents.

318 541.8 : 541.132

The solubility of silver acetate in aqueous solutions of some other acetates. The formation of diacetato-argentate ion. MACDOUGALL, F. H., AND ALLEN, M. *J. Phys. Chem.*, 46, *pp.* 730–737, *June*, 1942.—The apparent solubility product in the presence of added acetates increases more rapidly with the ionic strength than when the added salt has no ion in common with silver acetate. The apparent inapplicability of the theory of Debye can be accounted for by assuming the formation of the diacetato-argentate ion.

319 541.8 : 541.132

The solubility of silver acetate in aqueous solutions of silver nitrate and of silver perchlorate. Complex ions formed from silver and acetate ions. MACDOUGALL, F. H. *J. Phys. Chem.*, 46, *pp.* 738–747, *June*, 1942.—The results obtained are interpreted by means of the theory of Debye and Hückel and by assuming the formation of diacetato-argentate ion and of acetatodisilver ion. The dissociation const. of these complex ions were determined. It is suggested that the stability of one of these ions is due to resonance.

CRYSTALLOGRAPHY

See Abstr. 129 548 : 535.375.5

See Abstr. 164 548 : 537.226.2 : 538.22 : 536.631 = 3

See Abstr. 90, 91 548 : 537.531 : 535.4 : 534.321.9 = 4

GEOPHYSICS

320 551.510.535 : 621.396.11

The reflection of electromagnetic waves from a parabolic friction-free ionized layer. RYDBECK, O. E. H. *J. Appl. Phys.*, 13, *pp.* 577–581, *Sept.*, 1942.—[Abstr. 172 B (1943)].

321 551.521.64 : 537.591.3(494) = 3

Intensity variations of the hard component of penetrating radiation on the Jungfraujoch (alt. 3 500 m.). WÄFFLER, H. *Helv. Phys. Acta*, 14, 4, *pp.* 215–256, 1941.—Automatic continuous registration of the intensity of cosmic rays at high altitudes has been carried out throughout 1938, the ionization chamber used being shielded with 10 cm. of lead to filter out the less penetrating components. The dependence of intensity on atmospheric pressure is discussed, and the spontaneous decomposition of the meson is shown to be insufficient to account for the effect found. The diurnal variation of intensity is a simple wave whose phase and amplitude depend upon the season. There is also a 27-day period corresponding to the solar rotation. Monthly means give an annual variation of amplitude 1·5% of the total radiation, the min. being in May and the max. in Nov. The periodic variations found are compared with the heliomagnetic theory. The worldwide variations found elsewhere are confirmed by these observations.

A. HU

322 551.594.11 : 523.75

Correlation between atmospheric potential gradient anomalies and solar eruptions. COOPER, F. L. *Amer. J. Sci.*, 240, *pp.* 584–593, *Aug.*, 1942.—A series of observations of the atm. potential gradient, continuing a previous series [Abstr. 5075 (1936)] has been made. The time of the occurrence of max. and min. of the gradient is correlated with the time of eruptions on the sun. Large disturbances of the potential gradient, and also the storms, occur at the same time that a solar eruption occurs near the central meridian of the sun. Large disturbances of the gradient sometimes occur simultaneously with a solar eruption although the sunspot is not near the central meridian.

VARIOUS SUBJECTS

See Abstr. 172 575 : 537.213

See Abstr. 56 591.12 : 531.733

See Abstr. 266 621.78 : 539.531

See Abstr. 117 666.1 : 535.37

See Abstr. 203 669.018 : 536.413 : 538.082

See Abstr. 263 669.3 : 539.4.019

See Abstr. 66 677.46 : 541.182 : 532.133 = 3

See Abstr. 8 681.14 : 518.5 : 517.512.2

See Abstr. 298 77.012 : 541.141